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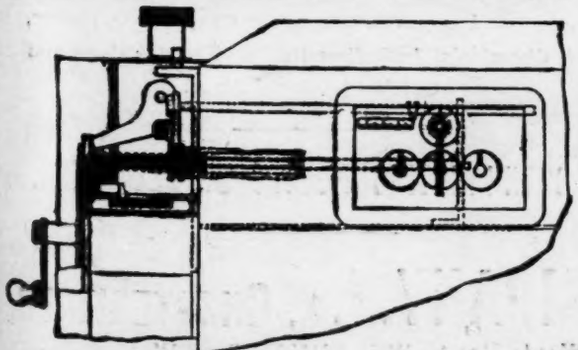
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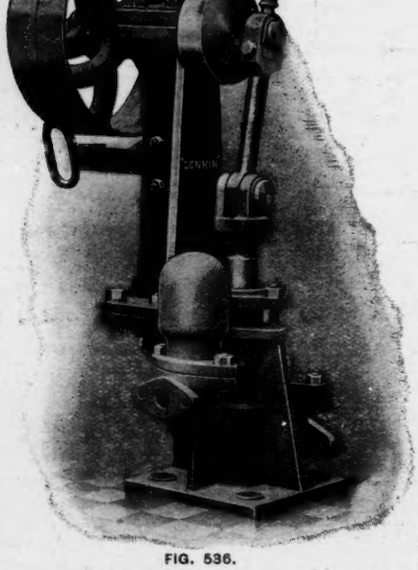

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EDITORIAL NOTES.

Clouds over the Coal-Fields.

THERE must be something fundamentally wrong in the coal industry when it is impossible to maintain peace in it at a time when the whole interests of the nation are in jeopardy, and when every unit of the nation should be up and doing his or her best share to defend those interests, and all within individual power to mitigate the effects of hostile influences. But to-day the nation is gravely menaced with trouble in that storm centre of the coal world—South Wales; and for this state of things several factors are responsible. In South Wales, the ending of one trouble only gives pause to set to work to bring another into being. The last difficulty there was patched-up with a 15 per cent. advance to the miners, in order to realize the resumption and continuance of coal-getting. But, unfortunately, there was incompleteness in the conditions attaching to the composure of difficulties, which seriously threatened to develop into something that would have been disastrous.

Then came what on many sides and by many people is regarded as the ill-advised concession of the Board of Trade to the South Wales coalowners of a further 2s. 6d. per ton upon the standard price of 4s. Ever since it was granted, there has been a sort of nightmare hanging over the coalowners and the Board of Trade, owing to the obvious intention of the men to have a share of this 2s. 6d. per ton. The threat has been brought to a head. The miners are asking for a 15 per cent. advance in wages as the new standard; while the coalowners submit a counter proposal for a 10 per cent. reduction, on the ground of the increased cost of production. The miners also want an independent joint audit of the coalowners' books for several years past. The owners will not agree to this; but they suggest that the miners shall be content with the audit of the books by a competent accountant over certain periods. The men also desire payment for small coal according to a tonnage rate to be agreed upon. This is quite a new point, as they have not hitherto been paid for the proportion of raised coal passing through a certain mesh screen, but only for the larger coal. Then they further ask that the equivalent selling price to the standard wage shall be fixed by an independent authority to be accepted by all parties. The men are taking up a determined attitude in respect of the claim for a 15 per cent. advance; and the 2s. 6d. increase of the standard price, in face of the wealth-laden balance-sheets of the colliery owners, is the real ground for the determination. Mr. Runciman, who consented to the 2s. 6d. advance, and has been worried about it ever since, has a tangle before him that will make him hesitate before conceding in other quarters an advance of the 4s. without irrefragable proof of necessity and justification. The Board have met representatives of the men, but have not succeeded in making the outlook brighter. They are going to try to bring the men and owners together in conference; but the prospect does not look hopeful of any mutual solution of the awkward conditions that have arisen. It is also noticed that the Workmen's Section of the Coal Conciliation Board for England and North Wales have asked the Coal Owners Section for a joint meeting to consider the desirability of some further advance in wages. In this case, however, it is understood that the proposal is not being put forward as a demand, but as a concession that the owners could reasonably make apart from the existing agreements.

The position of the avoidable absenteeism question is as ugly as ever. Threats of this and that do not appear to have much effect upon the men. The "Iron and Coal "Trades Review," however, rather thinks that, excepting in the case of particular pits and districts, there is greater regularity owing to the possibility of the debadging of men of military age addicted to absenting themselves from work, and replacing them by skilled men from the front. We do not know the grounds our contemporary has for this view, seeing that, at the Miners' Federation Conference at Southport last week, it was stated that reports from Yorkshire and Lancashire showed that absenteeism was rife there. As one writer puts it, the greatest regularity that is being shown by the miners at present is in the practice of irregularity; and the Miners' Federation seem disinclined to tackle the matter with the seriousness it deserves. Perhaps they are a little uncertain of their powers. They are proposing to fine the men who are inveterate in their absenteeism, as well as the owners who do not give facilities for full working. But how they are to compel the payment of the fines is not clear; and last week they had insufficient confidence in themselves to pass a resolution on the subject—preferring to defer a conclusion until a conference to be held next month. Nor are they sure of themselves on the debadging question. They seem to realize that it is the right thing; but some of their constituents have other views on the subject. That is the explanation of the shilly-shallying attitude with which the Federation approach many of the questions that from time to time confront them.

The Bottle-Shaped Gasholder Tank.

SOME interest has been evoked by the references made by Mr. Samuel Cutler, jun., and Mr. R. J. Milbourne, at the recent meeting of the Society of British Gas Industries, to the "bottle-shaped" or spheroidal gasholder tank, the idea of which apparently the Germans, whose propensity for appropriation and adaptation are world-renowned, borrowed from Mr. F. S. Cripps' invention of 1901. Previous allusions have appeared in the "JOURNAL" to this form of tank, the main intention of which is to replace the straight vertical tank wall, which is subject to unequal stresses and must necessarily be thick, by a curved and flexible wall stressed equally at all points. The renewed interest in the matter has induced Mr. Milbourne, in this issue, to give our readers a concise illustrated description of the new form of tank, which the Continent has adopted, but which we have not, but probably are just as well off for not doing so. The chief object of the construction is the saving of material. But if an economy in the thickness of material is going to be counterbalanced by other expenses in construction, there seems to be little advantage in departing from the vertical-sided gasholder; and it does appear, from Mr. Milbourne's article, that the spheroidal construction is not all gain.

In the discussion referred to, Mr. Cutler mentioned that holders had been erected on the Continent of from ½ to 4 million cubic feet capacity with the new form of tank, and having plates of a uniform ¼-inch thickness. Naturally, with the strains similar at all points, equality in thickness of plates is permissible; but in the method of realizing this equality and reduced thickness, one gets costs that must discount the saving. The curvature itself means bending or special rolling; and Mr. Milbourne, in his article, states that a strong top curb is most essential, and sometimes the bottom curb must be of greater strength than is necessary in a plain cylindrical tank. These differences represent costs to deduct from the saving in the thickness of plates. There is also the question of corrosion, in which connection Mr. Milbourne reminds readers of Mr. William Wilson's experiences with the corrosion of a steel gasholder tank at Falkirk, as described in a paper read at the last meeting of the North British Association. In that case, there is little doubt that the water used for filling the holder tank was affected, by an extraneous cause, in a manner which accelerated corrosive action. But still one never knows "one's "luck," although as "prevention is better than cure," it is always well to guard oneself against unpleasant experiences in this direction by a chemical examination of the water before admitting it into a steel tank for long service there. With thin plates, the stability of a tank would be, through

any corrosive action, jeopardized more quickly than would one built with thick plates. On the whole, we rather fancy that the spheroidal tank, with its thinner plates, will remain peculiar to holder construction on the Continent, and will not be imported into the practice of this country.

Tar Dehydration on Small Works.

If those in charge of small gas-works practising tar-washing, or with a good custom for treated tar for road purposes, have been possessed by doubts as to whether or not they should adopt a tar dehydration plant, there should be relief and action after reading the papers that Mr. J. Harger Pye, of Clevedon, and Mr. A. R. Wyatt, of Seaton, submitted a few days ago at the meeting of the South-West Association of Gas Engineers. For gas-works tar dehydration is a correct step; and we are with Mr. Wyatt in the opinion that the day will arrive—in fact, has already arrived—when the equipment of a gas-works is incomplete if it has not upon it a tar-dehydration plant. Of course, there can be no question that a properly designed plant is better than any makeshift; but we are not with Mr. Wyatt in saying that home-made plants give no satisfaction. Unless the owners of such plants are deliberately misleading, there are some who are not doing at all badly with the product of their own devising and construction. However, that is an incidental point in a paper which states tersely the requirements of tar dehydration.

The contribution by Mr. Harger Pye presents the financial side; and he speaks from experiences at Clevedon. If the plant is profit-yielding there, it should be so in a great many other places where one is not in existence to-day, to the financial disadvantage of the works. Mr. Pye uses a Wilton plant; and after paying carriage, he obtains about 4½d. per gallon for the light oils, of which he gets approximately thirty gallons per ton of crude tar, which means 11s. 4d.; and as he realizes on rail 30s. per ton for the dehydrated tar (for that sold locally 38s. to 40s. per ton is obtainable), his receipts work out to, say, 35s. 4d. per ton for the crude tar. His average dehydration costs being 6s. 4d. per ton, he has left 29s. per ton for the crude tar, against the quotation of 16s. per ton which the generosity of the tar distillers prompts them to offer. Consequently, he is better off by 13s. per ton through home treatment. These are some actual figures upon which the managers of small gas undertakings may set to work in investigating the matter on their own account.

There is another point to which Mr. Pye refers that has interest. Dehydrating at the temperature required by the Ministry of Munitions (230° C.) in order to extract the whole of the phenols, robs the tar of its fluidity; and it is unworkable for road purposes. Mr. Pye says he finds that one gallon (or 2½ per cent.) of creosote to 40 gallons of tar when working at 200° C., and two gallons (5 per cent.) of creosote per 40 gallons when working at 230° C., are quantities sufficient to allow the tar to flow slowly in or out of the cask. The ability to flow in and out of a cask may not be the best condition for road-surfacing purposes. The condition of the tar for such work should be that which permits the work to be done in the most economical manner in regard to area covered, labour, wear and tear of tools, and grit required. Experience on a large scale suggests that 10 per cent. of open creosote oil practically eliminates all the defects.

New Retort-House Practice in America.

For a long time, improvement in coal-carbonizing plant for the manufacture of gas appeared to be dormant in America—due to the then largely prevailing production of carburetted water gas; and for a period such extensions of coal-carbonizing plant as were made for town-gas production followed closely the lines of European practice. But there has been a revival in America in coal carbonization, and detailed study has been made not only of European practice but of the subject generally, with the view of if possible improving upon it—structurally, in method, and in qualitative result. Those who make it a rule to follow the information published in our "Register of Patents" will have noticed how frequently the name of the Riter-Conley Manufacturing Company has of late years appeared, with, jointly or singly, the names of Mr. H. A. Carpenter and Mr. A. W. Warner. Since 1913, the patent specifications upon which these names are found form quite a long series (the American series is even more voluminous); and, when read together, it is seen how completely they attempt to overhaul structure, methods, and results, with what degree of success one cannot judge until details of actual installations and working are to hand, with experience as to maintenance. But piecing together the different parts as represented by the patent specifications, it is seen that there has been throughout a well-directed aim. It is common knowledge among observers of American gas doings that there are installations in America to-day which embody the range of structural change and new practice; and that the installations present an excellent, clean, engineering face. Whether the "improvements" are really improvements, and will justify themselves, remains to be seen.

Taking, in the first place, the retort-setting itself, the inventors apply the term "mass structure" to their proposals, which simply means that the internal work is built-up of pre-formed blocks, preferably of silica material. It is not the first time that block construction has been employed in retort-settings, but not perhaps to the complete extent that is found in these settings—the retort walls themselves, as well as the side walls, being built of the pre-formed blocks. Erection can be quickly effected by them; and they are so arranged that they are not primarily brought into tight working relation until expansion takes place through the structure being raised to the working temperature. Then as the blocks are machine ground, there is very accurate fitting. This is a plan designed to favourably affect working stability; and the provision for expansion should prevent those uncomfortable cracks that are at times found early, and somewhat frequently, in certain retort-settings. The plan, too, materially reduces the cost for labour in building. In the paper that Mr. John West read before the Manchester Institution last May, he included a sectional elevation of a setting containing sixteen retorts in two vertical rows; and this illustrates the compact nature of the structure, and the large carbonizing capacity given by a single setting. Then the blocks themselves are channelled to form heating flues. There is relatively small heating effect by direct contact of the heating gases with the retort walls; but a relatively large heating effect is realized by storing-up heat in the side walls for conduction to the retort-walls. More information on this subject would be interesting; but one can well see that retort stability may be promoted by this method of construction, and that there will be protection against the drawing-in of furnace gases—in fact, the low percentage of incombustibles in the gas produced tells a tale of success in this particular regard. One would, however, like information as to the fuel account with this method of construction and heating. Then the "mass-"structure" of refractory material is enclosed in an expansible metallic casing, placed at a sufficient distance from the walls for the dual purpose of allowing the latter to have independent expansion, and to permit of insulating material being placed between. The finished metal-faced structure has a novel appearance to those accustomed to external brick walls. The casing besides adding to stability, no doubt, with its inner packing of insulating material, helps to prevent loss of heat by radiation. Another novelty is provided for—whether it has been put into practice cannot be definitely said, but we believe it has. It is that the mouthpieces are carried on the casing, and are so positioned that they are brought into alignment with the retorts by the expansion of the main structure when the setting reaches its working temperature.

A further structural detail has to do with the abandonment of the principle of one ascension per retort, and the adoption of a large ascension or "stand-pipe," into which a single row or double vertical rows of retorts delivers. For the single ascension for a number of retorts it is claimed that it not only saves labour and time by reducing the number of stopped pipes, but that it saves initial expense for the retort mountings, ground space for a given number of retorts, and that a greater number of retorts can be placed in one setting through their compact disposition. It can be readily understood that, in these circumstances, what appears to be an expensive form of construction would be reduced in relation to gas-producing capacity by this ability to increase the number of retorts in a given space. Moreover, a high initial cost must be judged by results—life of structure, maintenance, labour, and production. In regard to gas production, it would seem the inventors are looking rather to quality than to any exceptional quantity. The point as to a low content of inert constituents has already been made; and now it is proposed to enrich the gas by retaining in it

valuable products which have previously been "dissociated" from the main body of gas, and virtually lost." It is proposed to accomplish this by maintaining in the large ascension a uniform temperature of 1000° Fahr., at which temperature the lighter hydrocarbons are fixed in a permanent gaseous state. How the high temperature is realized is by so alternating the order of the retort charging that the resulting low temperature of the product of freshly charged retorts and the maximum temperature of the other retorts will result in the required fixing temperature in the ascension. Supplementary to this is provision for cooling the gas, by passing it into a cooling chamber and spraying with cooling liquid, for the purpose of relieving the gas of impurities before passing to the take-off main. Cooling is effected to a temperature of (say) from 110° to 125° Fahr., and so it is claimed that rich and relatively clean gas passes to the purifying plant—minimizing the capacity need, and so reducing the expense incident to the treatment of the gas. A further advantage is that the naphthalene carried forward is lowered to a small percentage. It should also be mentioned that the stoking machinery employed is electrically operated; and there are electrical controlling arrangements which positions the machine truly with the retorts, and which ensures that the retort-lids are simultaneously opened and closed at both the charging and discharging ends.

To sum up the claims for, or aims of, the construction and methods which are adumbrated piece by piece in the several British specifications, and make a very substantial showing. They are: Stability and durability of the settings, reduced cost of labour in building, greater carbonizing capacity on a given ground area, conservation of heat (which should mean a low fuel account), one large ascension or "stand pipe" for a plurality of retorts, no stoppage of ascensions (so reducing labour), regulation of manufacture, greater automaticity in retort-house operations, enrichment of gas by maintaining a uniform high fixing temperature in the ascension, sudden cooling by spraying on emission of gas from the ascension, thus throwing down impurities and reducing naphthalene to a harmless extent, and so relieving the work on the subsequent purification processes. Though not stated in the specifications, the gas has a low content of inert constituents; and even after being submitted to oil-washing it is said to possess high calorific power. On the other hand, what is the installation cost? Whatever it is, the declared advantages are worth a price. But whether all the introduced refinements are wholly successful in daily working has yet to be divulged to an interested British gas engineering profession.

Prepayment Meter Agreements.

Among the cases arising out of the use of prepayment meters recorded in the "JOURNAL" from time to time as having occupied the attention of the Courts, we do not recall one in which the dispute involved precisely the same facts as were discussed in an action reported on another page of this issue. In this instance, the amount in dispute was small; but there was a question of principle involved which the Pembroke Docks and Town Gas Company were bound to uphold. With an appliance so popular as the prepayment meter, circumstances which arise in one case are certain, at some time or another, to be met with elsewhere. The consumer claimed the return of 1s. which he stated that he placed in the prepayment attachment on the eve of the removal of the meter by the Company, and for which he had received no gas; while, on the other hand, the Company counter-claimed for 1s. 1d. (after allowing for the 1s. in the meter), the difference over a period between the money taken from the meter and the consumption registered by the index. The plaintiff had signed an agreement that, in the event of there being a difference between the automatic arrangement and the meter, showing that more gas had been consumed than there was money for in the box, he would pay for such additional quantity as might be registered. This was obviously a difficulty in his case; but the point was taken by him that he should be supplied by the Company with particulars of the readings of the meter and the sums collected from it since the date when the meter was fixed—ten years ago, so as to ascertain how the account stood between the parties. It was this application which led the Judge to declare that he did not propose to adjourn "a 1s. 1d. case," and to add that if plaintiff had written to him he would have forwarded the amount of the claim. This, of course, had reference only to the sum in dispute, and not to the importance of the case from other points of view. As already remarked, the Gas Company could not do otherwise than take their stand on the terms of an agreement which is now the basis of business between them and so large a proportion of their consumers; while on the plaintiff's behalf, it was also declared there was a principle involved. When admitting having signed the agreement, the plaintiff said he "had forgotten all about it." The placing of one's signature on a document involving legal consideration is a fact which should be carefully remembered.

"Multicooker" Declines the B.C.G.A. Challenge.

The "Multicooker" people decline to substantiate the much-vaunted merits of their gas appliances by an open and reliable test, or to compel the British Commercial Gas Association, under the terms of their "Truth" challenge, to enrich the funds of the Red Cross Society. Incidentally, they also put a bar to themselves making a contribution to these at the present time much-pressed funds. It is all as anticipated. The bare-faced falsity in their advertisements, as to a 75 per cent. saving in gas, is publicly exposed by their refusal to accept the terms of the challenge. They, however, express themselves willing, instead of accepting the results of the cooking work of two typical families each for a week, to enter into a contest to cook a single meal, and save 33 per cent.—not 75 per cent.—taking as a basis some figures found in a pamphlet issued by a gas company. The artfulness of this is very apparent. A single meal does not comprehend the hundred-and-one services which a gas-cooker renders in a household during (say) a week; and it is not a single meal, but the aggregate consumption figuring in a quarter's account that should disclose the 75 per cent. saving. That is to say, the consumption saving ought to be confirmed by a concrete 75 per cent. reduction in the quarter's payment. The accounts of not a few people have already carried conviction that they have been fooled. Having regard, however, to the strange character of the "Multicooker" advertisements, no test ought to be too drastic to enable the people who are responsible to the public in this matter to show that, if there is not a saving of 75 per cent., there is one sufficient, week in week out, to produce a substantial economy for those who "multicook." There is one thing certain, that the British Commercial Gas Association will make good use of the refusal to accept the terms of a test which "Truth" regards as "perfectly fair and equitable." Our contemporary leaves the public to draw their own conclusions. It would not be surprising to find before long that the "Multicooker" has retired for a period from the public gaze—at any rate, until the present incident has died-down; and then peradventure it will come forward again with all the audacity that has marked its recent money-making career, through the number of people whose credulity enabled them to swallow the bogus 75 per cent. saving.

Science in the Employment of Human Labour.

There is a prevalent desire, encouraged largely by the war, to place science in its proper place. It is now generally recognized that there is a correct and an incorrect way of doing most things; that the traditional way may not be the correct one; and that the doing of things correctly means that they are being done in a scientific way. In the employment of labour, men are engaged for a certain rate of pay; are given their allotted task; and they have to perform it, or go. But this does not comprise much in the nature of scientific method; and Mr. B. S. Rowntree, Director of the Welfare Department of the Ministry of Munitions, tells us, in a paper he recently read before the Circle of Scientific, Technical, and Trade Journalists, that the application of science is as necessary to the human element in factories as it is to the machinery and the methods of operation. That is only common-sense. Work is proceeding at high pressure to-day in our factories; and our industrial productivity as a nation will not attain its maximum in the future unless the fullest advantage is secured from labour by all ancillary means, which will enable it to work at its best without exhausting itself. Bad working conditions themselves are exhausting; and consequently they bar the road to maximum production. Science must remove these conditions. As Mr. Rowntree says, we must learn how to use human effort "in the most scientific and humane manner; and the experience now being gained should be of the utmost value in time to come." Apart from nourishing food and recreation, Mr. Rowntree puts among the factors which materially influence the operators, the

provision of "proper heating and ventilation, and adequate and suitable illumination;" and their neglect, he says, has a very prejudicial effect on the work done. The experience of the Ministry of Munitions "has shown that the removal of such defects has had a beneficial influence on quality and output of work." We are glad to hear it; but the truth of it can only be impressed, and the profit of such experience be gained, by a steady campaign of education among employers and employees.

Coke under Good Patronage.

Coke is under good and growing patronage to-day. The Highways Committee of the London County Council have placed an order for eight coke-burning mechanical stokers for use under the steam-boilers at the Greenwich generating station, from which the tram routes are supplied. They would not have done this without very good cause and confidence; and their action—combined with the considerable adoption of coke for steam-raising by the Main Drainage Committee of the same body, the Metropolitan Asylums Board, and the Metropolitan Water Board—must have an excellent effect upon the gas industry's coke market in the future. Though coke is selling at substantial prices to-day, those who now adopt its use, and so have two fuel supplies upon which to fall back, will realize the benefit of the lower prices for coke that are bound to follow the return of peace. The first of these sets of coke-burning mechanical stokers at the Greenwich generating station, it is estimated, will consume 100 tons of coke per day; so that there is going to be a substantial transfer to this station of material from gas-works for electricity generation. The approximate use of coal at the station is 165,000 tons; and the treatment at gas-works of the amount of coal—about double the 165,000 tons—that would yield the equivalent tonnage of coke would mean a considerable proportion of tar, sulphate of ammonia, benzol, and much else of value. What these secondary products would total to can easily be calculated by our readers.

OBITUARY.

The death took place on Saturday, at Southport, after some years' illness, of the wife of Mr. JOHN WEST. Up to the time of her breakdown in health, Mrs. Mary Ann West was a fairly regular attendant at the meetings of the Institution of Gas Engineers. She was in her 76th year.

The "Journal für Gasbeleuchtung" of the 4th inst. reports that Herr ERICH SCHERHAG, who had been Manager of the Gas and Water Works at Eupen since February, 1909, died on Sept. 24, after a short illness, at the age of 37 years. The deceased was a prisoner of war in France, having been captured at Perthes in February, 1915.

In one connection or another, the name of Sir HIRAM MAXIM, who died last week at the age of 76, is familiar to everybody; but he is specially known in the gas industry as the inventor of the Maxim patent carburettor for enriching gas. This invention was purchased from him now a good many years ago by the Gas Lighting Improvement Company, who are still supplying the apparatus to gas undertakings.

PERSONAL.

At St. Matthew's Church, Westminster, last Wednesday, the marriage took place of Mr. ALAN LISTER-KAYE, of Grappenhall, Cheshire, and Miss MARY CLARE FLETCHER, eldest daughter of the late Mr. Thomas Fletcher, F.C.S.

Mr. A. E. BUCKLEY, who has been fourteen years Engineer, Manager, and Secretary to the Holmfirth Gas Company, has been appointed Chief Engineer to the Malta and Mediterranean Gas Company, Limited. Under Mr. Buckley's *régime* at Holmfirth, the concern has made great progress. The works have been extended and remodelled; and the output has increased from 20,344,000 cubic feet in 1901 to 35,143,000 cubic feet in 1915, and the number of consumers from 1075 to 2246. The dividend also has gone up from 8 to 10 per cent.

Mr. W. E. CATON, who is shortly severing his connection with the Derby Gaslight and Coke Company to take up the position of General Manager and Engineer of the Oxford Gaslight and Coke Company, has been the recipient of a handsome present (in the shape of four pieces of Royal Crown Derby china) from the staff of the Derby Gas Company. The workmen at the Cavendish Street works, with whom he has been closely connected, also showed their esteem by presenting Mr. Caton with a further two pieces of this china; and, in addition, the workmen at the Belper station marked their appreciation of the courteous and genial nature of Mr. Caton in the practical form of a silver cigarette case and holder.

CALORIFIC STANDARD ACT APPLICATIONS.

Twelfth Official List.

THE receipt of applications from the following Companies is announced by the Board of Trade, for Orders under the Gas (Standard of Calorific Power) Act, 1916. The Sevenoaks Gas Company propose a calorific standard of 475 B.Th.U.; but in all the other cases 500 B.Th.U. is the figure mentioned.

BRITISH GAS LIGHT COMPANY, LIMITED: HOLYWELL, HULL, NORWICH, STAFFORDSHIRE POTTERIES, AND TROWBRIDGE.
NORMANTON GAS COMPANY.
PEMBROKE DOCKS AND TOWN GAS COMPANY.
PORTSEA ISLAND GAS LIGHT COMPANY.
SEVENOAKS GAS COMPANY.

Order Made by the Board of Trade.

WELLINGBOROUGH GAS COMPANY.

ELECTRICITY SUPPLY MEMORANDA.

THE technical men of the electricity supply industry are getting more and more enthusiastic over the question of reform in the application of fuel, with the view to producing generating economy, in order to cheapen electricity supply when normal times return. It is too late to bring about improvement now (other than with existing plant) in time to have any effect upon the inordinate fuel costs of to-day. The benefit, if there is any, in all the schemes discussed must lie with the future. But in joyfully contemplating the possibility of a reduction of fuel costs by one or other of the schemes, and computing the resultant effect on electricity charges, electrical engineers must not overlook the fact that generating costs are perhaps not more than 25 per cent. of the total disbursements that they have to make, and that, in view of the value of money and the greater weight of general obligations due to the war, now and for some time to come, capital charges will be heavier, and so will be the price of materials and goods needed for the development of electricity supply. Therefore an exaggerated estimate must not be made of the effects that would accrue from possible fuel economy alone, though no economy that can be achieved can be neglected. In an address to the Manchester Section of the Institution of Electrical Engineers, Mr. A. E. M'Kenzie expressed the view that, without being unduly optimistic, electrical engineers might anticipate the more economical production of electricity in the near future; and then he proceeded to address himself to the fuel problem. He passed in review the unsatisfactory position of late of coal supplies—the difficulties of both gas and electricity undertakings, the little value to many of the Price of Coal (Limitation) Act, and the evasion of the Act by some of the coal proprietors. The fuel procurable to-day is inferior to that obtained before the war from the same pits, owing to the amount of dross in it. In his opinion, it would be to the nation's advantage if electricity supply stations could in peace times obtain coal at reasonable prices. We hope Mr. M'Kenzie's generosity will allow us to include gas undertakings in the same happy thought; they, too, contribute largely, and in divers ways, to the nation's work and interests. Meantime, much can be done in the way of more efficient management of existing boiler-houses; and this is where we have all along considered the fuel economy campaign should have made its initial attack. In association with this point, the value to the electricity undertaking of the analytical chemist is proclaimed. Evidently, he could earn his salary over and over again by regularly testing delivered fuel, and keeping the coal suppliers up to their agreement in regard to quality. The analytical chemist should also be responsible for the correct treatment of the boiler feed water, and for seeing that scale and corrosion are prevented in the boilers. Finally, we have Mr. M'Kenzie stating that, with improved producers, the aggregate value of the bye-products recoverable from coal in its conversion to gas equals or exceeds the original coal value, and when extra capital and labour charges are taken into account, the procedure leads to a substantial rebate on fuel costs. The gas industry sincerely wishes that the former statement referred to their own experience.

Fuel Economy.

A Bye-Product Steam-Boiler.

When the Ministry of Munitions are asked to permit the manufacture of a new piece of apparatus as a matter of national urgency, and that by an electrical engineer of the eminence of Mr. George Wilkinson, of Harrogate, it may be taken for granted that he is well satisfied with his own invention. This has yet to be practically tested on the working scale; and, when it is, we shall be pleased to hear of the results. Pretty notions of the kind do not always in practice work out in accordance with anticipation. Mr. Wilkinson's attention was directed to this matter by the Corporation regarding the chimney shaft at the electricity works as an eyesore. All chimney shafts are eyesores; and there will be no place for them

anywhere in the future scheme of smokeless combustion, when coal will almost generally be deprived of its smoke-producing properties in closed vessels. Mr. Wilkinson's invention is a carbonizing arrangement and boiler in one plant. The coal is distilled, tar and ammoniacal liquor are extracted, and the coke, while incandescent, gravitates into the furnace. The gas is also, after being denuded of its products, passed into the furnace (under considerable pressure) with the necessary air, and burns with a smokeless flame until it enters into the retort-flue, where it is transformed into radiant heat. The whole operation of carbonization and combustion proceeds automatically; and, on the average, Mr. Wilkinson expects to get from 20 to 25 lbs. evaporation per square foot of heating surface. It is also anticipated that the boiler will furnish superheated steam by reason of a special arrangement inserted in the boiler itself. It is further calculated that twice or three times the amount of steam produced by the ordinary shell-type boiler per square foot of boiler floor will be furnished by the new boiler. This bye-product boiler that Mr. Wilkinson introduces is, considering all these things, a perfect marvel. An incidental duty assigned to it by its inventor is once and for all to end the present fashionable fuss about linking-up, and about concentrations of bye-product generating plants at the coal-fields. Moreover, the bye-product boiler is a desideratum, because: "Electrical and mechanical engineers, as a rule, know little of the subject of the distillation of coal, while gas engineers, who are skilled in the art, know little of boiler-house practice. Thus it comes about that there is no plant at present available for coal distillation and steam-raising at a reasonable price or of convevient and efficient design." Of course, Mr. Wilkinson does not intend to include his own invention in the second part of this quoted statement.

Tar Oils and Diesel Savings.

The members of the Diesel Engine Users' Association continue to pay a considerable amount of attention to the employment of tar oils in that class of engine; and the reports that come to hand disclose the fact that, with experience, working and economy are being enhanced. It will be remembered that some little time since, the Suffolk Electricity Supply Company sought the avoidance or suspension for the duration of the war of the Konrad Aust patent in connection with the use of tar oils as fuel in Diesel engines; and there is a feeling on the part of the applicants that, on national grounds, such action should have been supported by some Government department. This feeling was expressed by Mr. Napier Prentice at a recent meeting of the Association; but it seems that, after all, it may prove there was no large amount of value in the application. Since it was made, Mr. Prentice's experience in the use of tar oils in Diesel engines, without the fitting of any pilot ignition apparatus has been so satisfactory that he does not think it would be advisable for his Company to incur any costs in connection with the adoption of the method of working covered by the patent. He declares that he is now effecting a saving of about 50 per cent. in fuel costs by the partial use of tar oil. Worthing confirms this saving; for, on the same occasion as Mr. Prentice made his report, Mr. Geoffrey Porter, in giving some particulars of a pilot ignition apparatus which had been fitted to a Diesel engine at Worthing, stated that the saving in fuel costs obtained by using tar oils in this manner, with about 10 per cent. of crude oil for the ignition charge, amounts up to date to about 47 per cent. Still further corroboration came from Mr. W. A. Turner, who stated that he has worked a Diesel engine on tar oil with a slight alteration to the flame-plates, and has obtained a saving of about 50 per cent. in fuel costs. He further asserted that he has not noticed any corrosive action by the tar on the copper pipes or brass fittings. Electrical engineers are beginning to admit that there is more good coming out of the coal carbonizing industry than they at one time thought possible.

Another Instance of Diesel Trouble.

But we get one side of the picture of the Diesel engine presented in bright colours; and only occasional glimpses are permitted of the other side. We have referred on previous occasions to troubles—some very serious—with this type of plant. Another instance comes from Ireland. Just recently the Pembroke District Council made application to Mr. Justice Kenny to have a consent made a rule of Court. The defendants were the Diesel Engine Company, Limited; and the action was originally brought to recover damages for breach of contract for the supply of a 180 KW. Diesel generator set and fittings at a cost of £2977. The engine proved defective in the course of its trial working. Hence the action. However, there has been a settlement with the District Council for the sum of £1904 6s., with costs of the action. This is certainly not the best of advertisements.

Daylight Saving and Electric Lighting.

The "Electrician" has illustrated the effect that the characteristics of different supply districts had upon consumption for lighting purposes during the reign of the Summer Time Act. In an industrial area with a heavy power load, the loss of lighting consumption has in some cases been more than compensated, or (to use our contemporary's words) has been marked by the general progress that has taken place. But the difference in price between lighting and power units should not be forgotten. However, our contemporary says that at Birmingham the accounts of consumers in the residential areas showed a reduction of a little over 16 per cent., compared with the corresponding period of 1915. But the lighting output is only a small part of the whole, probably less than 10 per cent. On the other hand, the Winchester and Ealing undertakings are largely dependent on the lighting load; and in the case of the former, the loss was approximately 25 per cent., and in that of the latter about 23 per cent. In the address referred to in the opening paragraph of the "Memoranda" this week, Mr. M'Kenzie gave some figures as to the effect of the Summer Time Act on the Manchester electricity undertaking. A saving of 15 per cent. was shown by four of the residential districts; while in certain of the shopping and industrial areas, the saving was 8 per cent.

Energy Collapses and Idle Machinery.

Birmingham and its environs have been suffering further failures of the electricity supply; but this has chiefly affected the tramway service. There were, however, factories that had to face some inconvenience, which is much to be deplored in these days when national service demands high-pressure work, and maximum efficiency and output. But this is the very cause of the trouble; and the most far-seeing electrical engineer could not have forecast the demands that the war has made upon the Birmingham generating plant. Again at Accrington, there has been a breakdown, which in some reports is described as serious, and which, it is also understood, could not have been foreseen by the most alert electrical engineer. So bad, however, is it that Haslingden, which obtains its electricity supply from Accrington, has been informed by one of its own councillors that, unfortunately, the breakdown may not be rectified for some considerable time, and that there is under discussion a suggestion to lay a cable from Rawtenstall to Haslingden. If this is carried through, the consumers may obtain the benefit of a supply in a month. But, judging from a report of a meeting of the Trade and Labour Council, the position is evidently a serious one for the mill hands in Accrington and the district whose masters have placed their trust in electrical energy. The members of this body do not like the financial loss on the concern; and they, or rather the weavers at a couple of mills in Accrington, do not appreciate the loss of pay they have to incur through the stoppage of energy. The Secretary of the Weavers' Society or Union (whichever is the correct title) told the Trade and Labour Council that the workpeople at the two mills were constantly being sent home. Sometimes in one week they lost nearly one-half of their time. The result of this is that the operatives are demanding compensation at the Weavers' Office. The weavers are wise. Certain it is that they stand more chance of getting something from this quarter than from the statutorily fortified electricity concern.

A Carbon Filament Gas-Filled Lamp.

Inventions—actual and otherwise—in electric-lamps are plentiful, but there are comparatively few that survive, and lead a useful life, with profit to the makers. Those inventions that represent the "survival of the fittest" are mostly of German birth; and of such origin is another lamp to which attention is now drawn. It comes from Siemens and Halske, of Berlin, though they are not the inventors. These exist under the names of Kreusler, Gerdien, and von Pirani, also of Berlin. A description of the lamp has been published in the American "Electrical World;" and it is seen to mark the introduction of carbon filaments into gas-filled lamps. It would be singular, after the raising of metallic filaments to a plane above the carbon filament, if the positions were again reversed, and the carbon filament took place superior to the metallic filament. But if it be true that the use of a carbon filament with mercury in a gas-filled bulb will give greater freedom and strength in construction, and at the same time reduce the watt expenditure below that of the metallic filament lamp, then there is no doubt that the carbon filament will come into its own again. The first reason for proposing the change from the metallic filament to the carbon is that the former at high temperatures is considerably softer, which necessitates that the disposition of the parts of the filament shall not be too close. With the carbon type, comparatively large and compact helices can be formed. Shorter, thicker, and stronger filaments may be used, giving more liberty in filament design, as well as in voltages and candle powers. Thus it is hoped to produce carbon filament lamps for small candle powers, despite high current load.

Functions of the Gas and Mercury.

These are interesting. The bulb of the lamp is preferably filled at the start with an inert gas, such as nitrogen or argon, at about atmospheric pressure. When the current flows through the filament, mercury vapour forms in the interior chamber, due to the introduction of mercury with the gas. The original gas will be pushed entirely or partly away from the interior chamber towards the exterior space of the bulb and the pressure increased. As the pressure on either side of the glass envelope used is the same, the latter may, it is said, be heated up to a very high temperature without danger of explosion. "The outer wall of the bulb will remain relatively cool, and, by reason of this, will be able to withstand the comparatively high pressure above atmospheric. The envelope may consist of a tube which at its lower end is closed by means of mercury, and is separated from the remaining part of the bulb. In this construction, the incandescent body is placed relatively close to the exterior wall of the bulb, but due to the presence of the mercury

between the wall of the bulb and the incandescent body, the exterior wall can never assume too high a temperature. In one form mercury is placed at the bottom of the bulb, and provides a closure at the under part of the envelope between the space of the envelope and the glass bulb. In this construction, the conductors are prolonged downwards, for the purpose of having the filament near the surface of the mercury."

SIXTY YEARS AGO.

From the "Journal" of November, 1856.

Monopoly or Competition.—With the greatest facilities in the world for making perfect railway communication throughout the kingdom, we are worse off both as to expense and comfort than any country in Europe, merely because we were so jealous of monopoly that we allowed—nay, encouraged—the expenditure of more money in foolish parliamentary litigation than would, in many instances, have made the railway in dispute; and, having thus caused the investment of an enormous surplus capital, it is the unavoidable interest of every existing railway to perpetuate the evil by adding as much waste capital as possible to the cost of every fresh undertaking. To this monstrously absurd state of things the anti-monopoly cry about gas has been no exception; and we presume the public are content with both results. It is a disease of the national mind, and must be treated accordingly. Hence the danger of coalition until the real truth of the case has been made apparent to the great bulk of society. If everyone knew as well as we do that, with a never-ending change in the value of the raw material, gas could not be sold continually at the lowest price at which, under the most favourable circumstances, it can ever be made, we would gladly hail a coalition, not only of the City and Central Companies, but of every one of the Metropolitan companies; and this we would hail in the true interest of the public, even more than in that of the gas companies themselves. But does anyone believe that our lengthened experience in such matters is a fair measure of the knowledge of a majority of the inhabitants of London? The question is preposterous; and therefore we view with alarm a movement calculated to hide from the public the great truth we have all along inculcated, that, "with an article of uncertain value like coal, it is impossible to sell gas in the Metropolis, and pay a reasonable interest upon the undertaking, at a uniform rate of 4s. per 1000 cubic feet." Let us not, then, attempt to hide or gloss over a fact the thorough comprehension of which can alone give stability to the manufacture of gas. No matter with whom the error originated, or where the blame rests, the error which fixed the price of London gas at 4s. must be exposed and denounced. Without pretending that Mr. Croll is cleverer than anyone else, we have never questioned that his experience was large, and his talents at least of average quality. That his heart and his interests were united in his efforts to realize 4s. gas, no person can doubt; and hence, when we find him fairly avowing his inability to go on with it, we have little hesitation in saying that the Great Central Company will never be able either to obtain another contractor on the same terms, or to manufacture gas for itself and the City Company, so as to realize the dividend allowed by Parliament to such undertakings. We therefore think this coalition premature and ill-advised.

Gas Consumption in Germany.—Reference was made in the "Journal" for Sept. 26 (p. 695) to the monthly statistics of gas consumption in Germany collected by the Central Gas Bureau in Berlin; and the increase or decrease in the gas produced, as compared with the corresponding months of 1914 and 1915, was given up to the month of May last. Figures are now available for the next two months. In June, the gas made by 862 German gas-works was 1·2 per cent. more than in June, 1915, and 3·4 per cent. more than in June, 1914. In July, 852 works showed an average increase of 1·4 per cent. over July, 1915, and of 5·1 per cent. over July, 1914.

Self-Luminous Paint.—Writing in the "General Electric Review," Mr. W. S. Andrews says that, soon after the discovery of radium, certain phosphorescent mineral compounds were found to be so sensitive to the radio-activity of this element that they show luminescence when only brought near to it; actual contact being unnecessary. A fine quality of zinc sulphide proved to be the most responsive. A next obvious step was to mix a very minute amount of radium salt with finely powdered zinc sulphide, combined with a suitable adhesive, so that it might be used as a self-luminous paint. It is well known that the phenomenon of radio-activity is not confined to radium. A product of thorium, known as radio-thorium, is intensely radio-active; but it has a much shorter life than radium. Meso-thorium, from which radio-thorium is evolved, is a bye-product of the incandescent gas-mantle industry; and, on account of its relative cheapness as compared with radium, it is now being used extensively, either by itself or combined with radium, in the production of self-luminous paints. The relative merits of radio-thorium paint and that energized entirely by radium are unsettled; but both compounds will probably find their appropriate applications.

A NEW COKE-FIRED CIRCULATOR AND WASTE DESTRUCTOR.

A NEW type of welded steel hot-water supply boiler, known as the "No. 0 London," has been adopted by the London Coke Committee after exhaustive trials have proved its general utility and efficiency. As the smallest of the series of "London" steel boilers conforming with the requirements of the standard specification of the Committee, the new boiler has been designed to meet the more limited requirements of domestic service in flats and small houses, supplementing the list of larger capacity boilers of this series, suitable for houses of larger size.

In appearance the "No. 0 London" boiler is almost exactly similar to the "No. 1 London," illustrated in the "JOURNAL" for July 21, 1914, p. 159. The design embodies an improved rocking grate, capable of being operated without allowing the escape of dust into the room; while other important features are an open fire and a large hopper feeding shaft with a close fitting cover specially provided for facilitating the destruction of household waste. This is a service which, in present circumstances, is highly desirable and one which the boiler is designed to effect thoroughly—the fire-box being partly lined with refractory material, and therefore capable of generating a very high heat.

Tested under conditions of actual domestic service where the boiler had been connected to existing hot-water appliances in lieu of the discarded kitchen range, the results tabulated below (which, of course, are capable of wide variation) are typical of an average day's work:

7.0 a.m.	Coke-fire kindled with previous day's cinders.
7.45 „	Ten gallon sponge bath drawn off at 100° Fahr.
8.15 „	Twenty gallon bath at 105° Fahr.
8.45 „	„ „ „
9.15 „	„ „ „
9.45 „	Coke-hopper filled and regulating dampers shut.
10.0 „	Water at 130° Fahr. drawn off for washing-up.
11.15 „	Water at 140° Fahr. drawn off washing, cooking, &c.
1.0 p.m.	Water at 150° Fahr. drawn off for washing-up.
1.45 „	Twenty gallon bath drawn off at 105° Fahr.
4.30 „	Water at 150° Fahr. drawn off for washing-up.
7.0 „	Fifteen gallons bath at 105° Fahr. drawn off.

The fire was not clinkered during the day. The refuse consumed between 8 and 9 a.m. included a mustard tin, a salmon can, cabbage leaves, and other vegetable and animal matter. The coke consumed, 25 lbs., cost, at 31s. 8d. per ton, 4½d.

The apparatus connected to the circulator included a bath, lavatory basin, and a kitchen sink. The storage tank—well protected from cold air currents—was of about 30 gallons capacity.

OSTWALD PROCESS OF OXIDIZING AMMONIA.

A summary is given in the current issue of the "Journal of the Society of Chemical Industry" of an article that appeared in "Metallurgical and Chemical Engineering" [current volume, No. 15, pp. 299-304], by Herr F. C. Zeisberg, on the "Ostwald Process of Oxidizing Ammonia to Nitric Acid."

From a *résumé* of the information available (which is to be regarded with reserve) it is concluded that the Ostwald and similar processes for the manufacture of nitric acid by the catalytic oxidation of ammonia can hardly compete with the sodium nitrate or arc processes—the possible margin of profit being very small even when the price of ammonia is low. The process possesses the advantages of being continuous and capable of installation in small units. It also requires little power and relatively small absorption apparatus; the exit gases from the converters being several times as concentrated as those from any arc furnace. It is, however, only a step, not a complete process; and the plant would have to be located with respect to economy of freight on incoming supplies of ammoniacal liquor or cyanamide, and the cost of ammonia would have to be improbably low for profitable operation.

On the basis of 85 per cent. and 97 per cent. yields for the Ostwald and sodium nitrate processes respectively, and with sodium nitrate and ammonia at the present prices—viz., 2·64 c. (1·32d.) and 13·25 c. (6·62d.) per lb., respectively, the cost of 93 per cent. nitric acid would be 5·471 c. (2·73d.) per lb. by the former and 5·5 c. (2·75d.) per lb. by the latter process. The corresponding costs with sodium nitrate at 1·5 c. (0·75d.) and ammonia at 7·5 c. (3·75d.) are 3·621 c. (1·81d.) and 3·88 c. (1·94d.) per lb. respectively. On the basis of equal yields (97 per cent.), nitric acid could be produced for about 0·5 c. (0·25d.) less per lb. by the Ostwald than by the sodium nitrate process; but according to the most trustworthy evidence, the conversion efficiency of the Ostwald process appears not to exceed 85 per cent.

During the present session of the Yorkshire Junior Gas Association, a paper on "Furnaces" will be read by Mr. E. A. Leask, Sales Superintendent to the City of Leeds Gas Department.

AN UNNOTICED ACTION OF BOG IRON ORE.

By Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S.

One of the most important among the many valuable items referring to the use of oxide of iron as a purifying material that were set forth in the paper on "Purification," submitted to the Midland Association of Gas Engineers and Managers by Mr. W. C. Jones [see "Journal," Oct. 31, p. 357], passed without notice in an otherwise full discussion. Using Staffordshire coal, carbonized for twelve hours in full retorts, at a heat that secured a large yield of gas but a low make of ammonia—conditions by no means favourable to a low result, so far as sulphur compounds other than sulphuretted hydrogen are concerned—the author is able to keep down these compounds to between 19 and 30 grains per 100 cubic feet of gas. The best results are secured when a bog ore rich in organic humus is in use, as the humus has a powerful action on the sulphur compounds, splitting them up, with liberation of sulphuretted hydrogen; and for this reason, new bog ore should not be used in the last box of a series, or in a catch box. I do not recall any previous record of difficulty on this account, or of a new oxide being observed to show a clean test to lead paper at the inlet and at the same time a foul test at the outlet.

Several speakers in the subsequent discussion alluded to the sulphur compounds in connection with purifier experiences, and some of them apparently worked under conditions similar to those indicated by Mr. Jones. But they did not credit the oxide purifiers with any assistance in this way. The general practice was to reduce the sulphur compounds by means of ample washing or scrubbing with "strong" ammoniacal liquor, before ever the gas reached the dry purifiers. In this manner, they were able to get the sulphur compounds close down to the limits formerly imposed by the London Gas Referees without resort to the use of sulphided lime and the complete removal of carbon dioxide, or the the use of any other special process. Apparently, Mr. Jones favours the employment of "manure from stables where moss litter is used as a bedding," not only on account of its physical properties, but also because of its chemical action on the sulphur compounds. Moss litter in its natural state has been extensively used, within the writer's knowledge, for admixture with "heavy" oxides for many years.

About fifty years ago, in 1867, the Rev. W. R. Bowditch published a remarkable work on "Coal Gas," describing a large extent of experimental research in connection with the condensation, purification, and chemical composition. The retort-house does not appear to have attracted much attention, as that part of the plant is scarcely mentioned. On p. 24 *et seq.* he refers to the use of "clay" as a purifying material, which he introduced in 1854—first, and principally, as a means of removing ammonia without at the same time damaging the illuminating power of the gas [in another part of the book, he inveighs strongly against the use of clean water for washing gas], and, secondly, to remove sulphur other than sulphuretted hydrogen.

Clay removes ammonia as effectively as acids or metallic salts, though not on this score entitled to any preference. But if a current of gas is passed through a series of ten to twelve vessels, charged alternately with clay and lime, lead paper will show a clean test at the outlet of each lime box, but a foul test after passing through the clay. Incidentally, this experiment shows that the action of the clay is not very energetic, as, after passing through four or five layers of clay, there is evidence that the whole of the sulphur compounds have not been decomposed. Speaking after eleven years' experience, which covered the use of the fouled clay as a manure for all kinds of crops, and on tens of thousand acres of land, he stated that nothing which the farmers could buy would compete, value for value, with fouled clay as a manure. The clay could be obtained at a low price in most localities, and, when saturated, would sell at a guinea per ton. The used material would give off sulphuretted hydrogen when treated with a mineral acid, and ammonia on the addition of a fixed alkali. Apparently the ammonia was not fixed; and one might fully expect that the sulphide must be completely oxidized by free exposure to the atmosphere previous to its application on the land.

Gas made in iron retorts could be practically freed from sulphur; but when clay retorts and higher carbonizing temperatures were used, the removal was not complete. Even in these circumstances, however, the sulphur could be kept below the maximum allowed by Parliament. Clay, so far from lowering the illuminating power, actually improved it by removing impurities that would reduce the value of the gas if left in it.

"Clay" is an indefinite term; and it is to be regretted that more detail as to the actual composition of the material referred to under this title, and the method of preparation adopted to obtain it in the light pulverulent form requisite for any material that is to be successfully used in purifiers of the dry type, are not given. As ordinarily understood, "clay" does not commend itself as an ideal substance to deal with. If dried in the first place to an easily crumbling condition, it might be expected, when in use, to become sodden in parts by moisture abstracted from the gas, and to give trouble from back-pressure. Natural iron ore containing some 30 per cent. of clay is extensively used as a material for the dry purifiers, and is always found to require admixture with sawdust or other similar lightening agent. The inference is that anything approaching the composition of pure clay could not be used with satisfaction, unless prepared after a similar manner. This suggests that, in the operations recorded by the Rev. W. R. Bowditch, a clay containing an appreciable proportion of "organic humus" was selected in the first place, or that a material of this nature was mixed with it before use.

Notwithstanding the advantages claimed for the use of "clay," one is not surprised to find that the author subsequently rejected it, and pinned his faith to lime at a temperature of approximately 400° Fahr. as a means of removing, or at least reducing, sulphur compounds. Possibly his choice was influenced by the increased favour accorded to washing and scrubbing, and to the fact that gas engineers began to talk about sulphate of ammonia at £20 per ton. For it is apparent that the removal of sulphur was an incidental matter, and that the real object in view was to obtain a material sufficiently rich in ammonia to realize a profitable price as a manure. And the questions we may now ask are: What is the explanation of the value of clay as a means of reducing the sulphur compounds? Was it due to any property peculiar to clay, or to the incidental presence of organic humus? Or was the sequence of the action, first the absorbtion of free ammonia, next the sulphiding of the same, and, lastly, the absorption of sulphur compounds by the resulting alkaline sulphide.

The late Mr. R. H. Patterson gave much attention to this subject, and observed that under some conditions the oxide of iron would reduce the sulphur compounds. But his experience was the opposite to that recorded by Mr. Jones. He found that the action was confined to fairly old material, containing a large proportion of free sulphur, and credited the sulphur with the production of the results, on the principle of some chemical affinity existing between bodies similar in properties as well as between those of opposite character.

That the sulphur compounds can be substantially reduced by washing with ammoniacal liquor is a matter of common knowledge; and from the fact that a general preference was expressed for "strong" liquor, it would seem that, contrary to the experience with calcium sulphide, the presence of carbonic acid is not a fatal objection. On account of the solubility of ammonia in water—780 volumes to one at ordinary temperatures—a very small quantity of water will account for a considerable amount of ammonia. Sulphuretted hydrogen is soluble to the extent of 2½ to 3 volumes in one of water, and carbonic acid in about equal parts. The usual idea is that the several impurities are taken up in some respect according to their different solubilities (the more soluble ones taking the preference), and that a moderately weak liquor contains as much sulphuretted hydrogen as, or perhaps more than, a "strong" one, and also less carbon dioxide. It would therefore appear better suited for the decomposition of sulphur compounds than a liquor of full gas-works strength.

I have seen an argument prepared with a view of creating a feeling of prejudice and alarm against the use of gas in the household, to the effect that if the large gas companies, with every advantage afforded by the employment of the best available scientific skill, cannot keep the sulphur compounds down to 20 grains per 100 cubic feet, what must be the state of the gas supply in a small country town, where the purification is under the charge of a working foreman? The inference is that the gas under the last-named conditions is less pure and more injurious. As a matter of fact, the reverse is the case. A large scrubbing or washing plant, giving an area in proportion to the make far exceeding anything that would be practicable in a large works, is provided for the sake of the ammonia; and an incidental result is that the gas made on a comparatively small scale rarely exceeds 20 grains of sulphur per 100 cubic feet. I have found it practicable to run on for months at a time with 12 to 15 grains.

The whole question might with advantage be the subject of further investigation, the principal points being: (1) The properties of organic humus as regards decomposition of sulphur compounds, and formation of sulphuretted hydrogen. (2) The most efficient composition or strength of ammoniacal liquor, and the effect, if any, of the presence of carbon dioxide. (3) The possible mechanical retention of sulphided ammonia by the "free" sulphur. According to the Rev. W. R. Bowditch, the blackening of lead paper is not necessarily a proof of the presence of sulphuretted hydrogen. He quotes experiments proving that the existence of another sulphur compound possessing the same property, but does not say whether it is also absorbed by ferric hydroxide or calcium hydrate.

Masonic.—At last Wednesday's regular meeting of the Evening Star Lodge, No. 1719, the election took place of the Worshipful Master for next year, to succeed W. Bro. J. Fred. Wicks. Bro. Archibald P. Main, S.W., was appointed. Then to follow W.Bro. A. E. Broadberry, as Treasurer of the Lodge, W.Bro. F. W. Cross was elected; and he was the recipient, as a gift from the brethren, of the regalia of "London Rank," to which he has recently been appointed.

Water-Gas Workers and Unemployment Insurance.—The Umpire has decided that contributions in respect of unemployment insurance under the National Insurance (Part II.) (Munition Workers) Act, 1916, are payable in respect of workmen engaged wholly or mainly in attending producer or water-gas plant in connection with a factory or workshop which is engaged wholly or mainly in carrying on any insured trade or munitions work. Contributions are not payable in respect of workmen employed by a gas company and engaged wholly or mainly in the manufacture of carburetted water gas.

STEEL GASHOLDER TANKS.

By R. J. Milbourne, Assoc.M.Inst.C.E., F.C.S.

In the discussion which followed the reading of the half-yearly report of the Chairman (Mr. H. M. Thornton) to the members of the Society of British Gas Industries in October last, Mr. Samuel Cutler, jun., when speaking on the subject of trade after the war, contended that too little individual effort had been made in the past by English gas engineering contractors to maintain and retain the connection and trade which we as a nation possessed previous to the war. He suggested that English gas engineering inventive skill was somewhat behind that of the Germans; and, as an example, he drew attention to a comparatively recent invention—commonly known as the "Bottle-Shaped Gasholder Tank"—which is of German design and construction, and which has replaced the plain cylindrical tanks in most of the up-to-date Continental gas-works.

Up to the present time practically all steel and iron above-ground gasholder tanks erected in this country and in most foreign countries, have been made in the form of plain cylinders. There was little to complain about in this design; for it was simple and easy to construct for gasholders up to moderate dimensions. But when gasholder tanks were required to be of large diameter and greater depth, the lower rows of side plates needed to be of such a thickness, and the vertical plate joints of such strength and weight, and consequent expense in the construction and handling, that designers began to feel that the limit was fast approaching to which steel or iron gasholder tanks could be made.

The bottle-shaped—or what is technically known as the spheroidal—tank, of which a description is now to be given, is based on an old scientific fact; but its application to a gasholder tank is practically new—that is to say, it has not received very serious attention in this country. Its shape is perhaps most easily described as being similar to the globular portion of a wine decanter, whose sides should conform to the natural curvature of a globule of water.

If a thin rubber silk bag be filled with water and allowed to rest on a flat hard surface, it will be noticed that the bag will take a position of equilibrium so that its surface will assume a spheroidal form. The stresses in the skin will be tensile and evenly distributed if the bag is full of water. During filling and emptying operations—which should occur at very rare intervals in the life of the gasholder and tank—stresses in the skin when the tank is partially filled will be of a different character from those set up when the tank is full, necessitating the inclusion of stays, connecting the vertical compression members transmitting the heavy vertical load thrown on the top curb to the surface upon which the tank stands.

With the sides of a spheroidal-shaped tank arranged as shown in fig. 1, the horizontal pull in the tank skin is transmitted direct

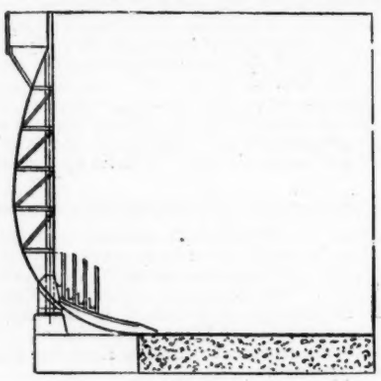


Fig. 1.

to the bottom plates of the tank; but with a spheroidal tank, after the manner of fig. 2, there is obviously a tendency for the extreme ends of the curves of the tank sides to approach each other when the tank contains water. Consequently, strong girders are required between the struts which connect the top curb of the tank with the bottom curb; and a strong horizontal ring of girder form may be required to form the outer ring of bottom plates With each of the above designs, a strong top curb is necessary so as to take the horizontal or radial component forces acting at the ends of the side plates.

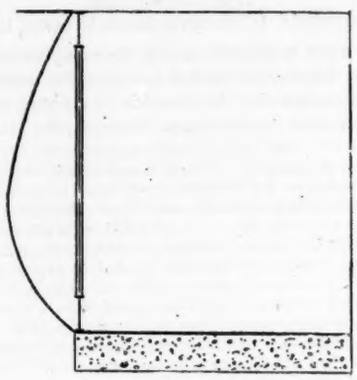


Fig. 2.

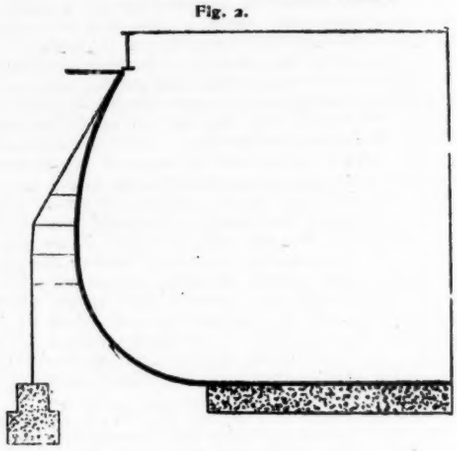


Fig. 3.

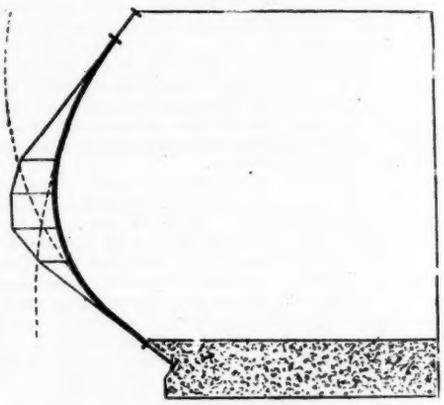


Fig. 4.

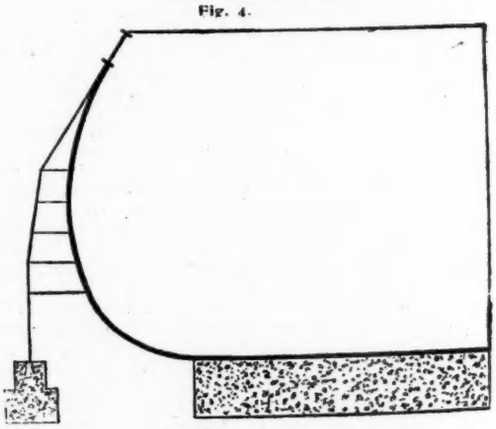


Fig. 5.

There are other designs [see figs. 3, 4, and 5] of tank sides similar in character to those already referred to, in which the top and bottom curbs are supported or tied externally, instead of being connected together by means of struts between the top and bottom curbs.

Figs. 3 and 4 show the top or bottom curbs inclined; whereas

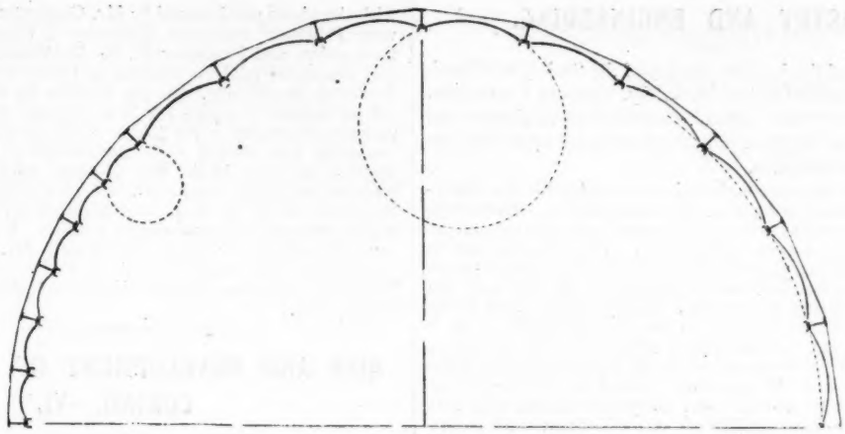


Fig. 6.

in fig. 5 the top curb is shown made in the form of two girders at right angles. In all the previous diagrams the side plates of tanks have been curved in elevation, with the object of reducing the side plates taken throughout in thickness, with the consequent lessening in the weight of the tank.

In fig. 6 is shown a design in which the side plates are curved in plan to a radius less than the radius of the circular tank itself—use being made of the fact that the stress on the curved surface of the water-containing vessel at any point is not only proportionate to the depth of the water, but also to the least radius of the side of the surface. Hence the smaller the radius, the less the stress. This design necessitates the inclusion of standards. In the case of a column-guided gasholder, the guide-rail in which the bottom rollers of the outer lift work could be utilized, and be firmly secured to the bottom plate of the tank and to each other by means of strong girders tied at the top. They would also, in addition to being strong enough for their duty as guides to the gasholder bell, be made strong enough to withstand the bending moment put on each of them by the unbalanced outward component forces acting at the ends of the curved side plates.

This design [fig. 6] was invented and patented in 1901 by the well-known Consulting Gas Engineer, Mr. F. S. Cripps, who has endeavoured to achieve in plan or horizontal direction what the German engineers have tried to do subsequently in elevation or vertical direction—viz., reducing the weight of the bottom row of side plates in large and deep tanks. While the name of Mr. Cripps has been placed last, he appears to have been the first to invent gasholder tanks with bulged sides, as the principle underlying the design of all those with bulged sides is the same.

Although the endeavour to reduce the weight of the tanks and their cost is praiseworthy, it must be borne in mind that after the tanks are erected and have been in use for some time, that insidious demon of all steel work, called by us "corrosion," begins to show that he has been at his evil work; and therefore before reducing the thickness of steel gasholder plates to their lowest limit, it is necessary to bear in mind the experience of the Falkirk gas engineer, who informs us [see "JOURNAL" for Sept. 12 last] that some of the side plates in his 154 ft. 6 in. diameter gasholder tank were corroded to $\frac{1}{16}$ inch in depth, and that this corrosion was observed to have taken place in about eight years after the erection of the tank; also that the rivets were badly attacked, and which he states occurred not only at the water line but in those parts of the tank that are always covered with water.

Of course, the water in a gasholder tank should be kept as far as possible free from impurities or any deleterious substance that is likely to harm the plates and other steel work; and the water it is proposed to use should be analyzed if it is at all suspected that there is any chance of its being harmful.

It is, however, interesting to note that with all tanks with bulging sides shown in the diagrams the top curb, and sometimes the bottom curb, must be of greater strength than is necessary in plain cylindrical tanks.

AN AMERICAN INCLINED OVEN PLANT.

Favourable results being reported from an installation of inclined ovens in operation at Linton (Indiana), it was decided that, with some necessary modifications, similar plant would meet the requirements of Battle Creek (Mich.), where extended manufacturing capacity was called for; and work was put in hand which was described by Mr. F. G. Remington, the General Superintendent, at the recent meeting of the Michigan Gas Association. Some of the main reasons for adopting the scheme were the large production it offered per square foot of ground area (the available space being limited), the comparatively low cost of installation per 1000 cubic feet of gas made, and the elimination of skilled labour and charging and discharging machinery.

The unit decided upon consists of six settings of three ovens each, built in one battery, each setting complete with three inclined ovens, one generator, and two banks of recuperators, with steam superheater and primary-air blowers. The battery of eighteen ovens is approximately 76 feet long, 16 feet from front to back, 19 ft. 6 in. high at the front, and 30 feet high at the back. The ovens have an average width of 14 inches; being 16 inches at the lower or discharging end and 12 inches wide at the upper or charging end, 19 feet long, 5 ft. 8 in. high, all inside dimensions, and will hold a charge of 5500 lbs. of coal crushed to $\frac{3}{4}$-inch and under. They are designed to carbonize this amount in twelve hours.

The ovens are heated with four parallel flues, each flue having an independent gas and air control. The ovens are equipped with self-sealing doors; and a manual emergency pusher is provided, in case a charge hangs, due to over or under carbonization or accumulation of carbon. The oven-doors on the discharge end are removed by means of a manually operated crane, travelling on an overhead track in front, and extending the entire length of the battery.

The charging-hole of each oven is located at the top and back of the oven. Each oven has one 10-inch gas offtake; each offtake being provided with a quick opening and closing counterweighted mushroom valve. The collecting main runs the entire length of the battery, and has a fall of $\frac{1}{4}$ inch to the foot.

The flushing and circulating apparatus for the gas collecting main consists of a steel separating tank which receives the tar and liquor from the collecting main, and an ammonia pump which forces the hot weak liquor from this separating tank through the bottom of the gas collecting main. Pitch, carbon, and heavy tars are forced out at the end of the collecting main and caught in a special trap there. The lighter tars from the separating tank overflow, and are conducted to the tar-separators by gravity.

The coal is discharged from the railroad cars into a track hopper. From the track hopper, it is carried on an apron feeder conveyor to the coal crusher and pulverizer, and elevated by means of a continuous bucket elevator conveyor to the overhead coal-bunkers, having a capacity of 100 net tons. The coal is discharged from the overhead bunkers through four discharging valves into a travelling charging lorry (provided with scales), from which it discharges by gravity into the ovens.

The coke is discharged from the ovens into a coke-quenching car, running on a track in front of the ovens, and operated by a cable and electric motor. The coke is transported in this car to a quenching station placed at the end of the battery, and thence to a track hopper, and from the track hopper on an apron conveyor to a continuous bucket elevator. The coke is elevated and discharged into a rotary screen, which is designed to separate it into three sizes—furnace, stove, and nut. These various sizes of coke are discharged from the rotary screen into an overhead receiving tank having three compartments. The furnace compartment has a capacity of 50 tons, and the stove and nut compartments capacities of 25 tons each. The breeze is discharged from the screens through a spout directly to the boiler-room. The sized coke is taken from assorting bins in industrial cars on an overhead coke-trestle to water-gas generators, oven generators, waggon loading bins, and yard storage. The furnace coke, when desired, can be spouted from the end of the rotary screen directly to the waggon loading bins.

The coal and coke handling machinery is driven by electric motors; the total horse power required being 135.

The Winter General Meeting of the Institution of Water Engineers will be held at Burlington House, on Friday afternoon, Dec. 8. In addition to the formal business, two papers will be read and discussed—one by Mr. W. J. E. Binnie, on the "Cross Hill Covered Service Reservoir for the Birkenhead Corporation," and the other by Mr. Charles Clifton, dealing with the "Rating of Water-Works."

CHEMISTRY AND ENGINEERING.

At the meeting of the London Section of the Society of Chemical Industry on Monday of last week, Mr. CHARLES CARPENTER, D.Sc., initiated a "talk" about chemists and engineers and their relationship to the great problem of bringing up-to-date our national chemical industries.

The education of chemists and engineers engaged in the chemical industry formed the topic of Mr. Carpenter's introduction to the discussion; and as indicating his views on the matter, he set forth the policy adopted in the Navy. The entering age in the Navy for cadets is 13½ years; and the training includes physics, chemistry, applied mechanics, applied electricity, and engineering with workshop practice. Every officer and every cadet, no matter what his future in the service might be, goes through this training. At the age of about 17 years, however, there is a preliminary sorting-out, with the object of allowing the cadets to specialize in the particular branch of the service to which they wished to belong. Mr. Carpenter hinted that this would be the best method for dealing with all scientific education —namely, to give a general training in all the sciences, and later to allow the student to specialize. In this way, chemists would be trained who would have a certain amount of engineering knowledge, and engineers would be trained with a certain amount of chemical knowledge; and the co-operation of the two in the chemical industry would lead to the best results.

The function of the teachers during the preliminary training should be to ascertain in what direction the mental capacity of each pupil lay, and to direct him to follow the right main road. In the branch of chemistry with which he was most closely associated, there had in the past been much lack of progress through the engineer not deciding to take the chemist into his council; and he was also sure that, had the chemist taken the engineer into his council, matters would have gone very much further forward than they had. The two must work in harmony; and he could not but think that the chemical industry had been to some extent partly sterilized by the narrow spirit in which some chemical manufacturers regarded their operations. If we started with the theory that everyone could be trained to be an engineer or a chemist, we should go hopelessly wrong. He had had experience of the engineer working on his own and of the chemist doing likewise; and it was a course that resulted only in inefficiency. The plan he had found best was to organize two staffs working under the control of a chemist on the one hand and an engineer on the other, who consulted together and so got over their difficulties. He would be sorry to go back to any other system now, because only in this way could he build-up, maintain, and increase the strength and the well-being of chemical science.

Dr. HAROLD G. COLMAN said it was very difficult to talk about this matter without bringing in the blessed word co-operation or co-ordination, and he was heartily in agreement with what Mr. Carpenter had said as to the meaning of it. In addition to the combination between the engineering and chemical sides, there was also the question of cost of production, which, although Mr. Carpenter had not specifically mentioned, he no doubt intended to include. However, in using the term chemistry they were a little unfair to their physical brethren, because industry was not only concerned with chemistry, but was equally concerned with physics; and he could not help feeling that the thing which had done so much harm, and would do more harm yet, was that all of the three interests regarded themselves as the biggest factor in the position, whereas all three were absolutely equally essential for progress. Therefore, if the idea got about that because the engineer had had his own way in the past, he should not have it in the future, or because the physical man had not had so much his own way in the past he should have it in the future, progress would not be made.

Mr. J. W. HINCHLEY advocated special training for the chemical engineer—a man who should have an adequate knowledge of both the chemical and engineering sides. At present, the engineers engaged in the chemical industry were largely mechanical engineers, who utterly failed to appreciate the chemical side of the business.

Mr. JACQUES ABADY agreed with Mr. Carpenter's advocacy of a general education with specialization at a later stage as the only means to avoid putting square pegs in round holes. There had been a great deal of talk about our backwardness compared with Germany, and our educational system had been blamed for it; but he did not think those who held these views had quite made out their case. It was a question whether the supply created the demand or the demand created the supply. One thing was certain, that when the general manufacturer awoke to the fact that no matter his line of business he could in nine cases out of ten improve his production, lessen his costs, and increase his profits by improving the trained talent of the engineer and the chemist, great progress would be made. In order, however, that the combination of the engineer and the chemist should be completely successful, it required the addition of the third interest—namely, the commercial or financial side.

A large number of speakers took part in the debate, and some held the view that efforts should be made to train a special class of man, known as the chemical engineer, while others agreed with the views put forward by Mr. Carpenter. Among the latter were Professor Smithells, Professor of Chemistry at the Leeds University, and Professor H. E. Armstrong. The reason why Mr. Carpenter held the position of President of the Society, said Professor Armstrong, was not because he was a chemist, as he did not believe he claimed to be a chemist—he had merely picked up some chemistry in the course of his career [laughter]—but because he had shown such extraordinary sympathy with the chemist, not only in the way of doing what he had referred to with regard to his own staff, but by actually co-operating with the chemists on his staff, and together with his chemists producing altogether extraordinary results. It was a case in which example was far better than precept. Mr. Carpenter was the first man in this country who really had proved that it was possible for the engineer, pure and simple, to have any sympathy with the chemist.

RISE AND DEVELOPMENT OF BYE-PRODUCT COKING.—VI.*

[COMMUNICATED.]

THE RECOVERY OF AMMONIA.

UNTIL comparatively recent times, ammonia was recovered on coke-oven plants almost universally in the form of sulphate; but of late years occasionally other forms of ammonium compounds have been manufactured. The introduction of the hot direct-recovery process called attention to the possibilities of ammonium chloride; and at the majority of plants where hot direct recovery is in use chloride is recovered.

All coals contain a proportion of sodium and potassium chlorides which result in the ultimate formation of fixed ammonia. This is perhaps best extracted by using liquor to circulate in the gas conducting main and in an additional washer-scrubber. If this is not done, it is found that a considerable amount of chloride is deposited in the gas-main, and this, mixed with pitch, frequently causes serious blockages in the main. By circulating liquor, the deposit of chloride is dissolved and a fairly concentrated liquor is obtained, and at the same time the pitch trouble is largely eliminated. Frequently the deposits of chloride pitch scraped from the main are thrown on one side and wasted. It should be borne in mind that chloride is much richer in ammonia than is sulphate; and hence this waste represents considerable loss. It can be avoided in the following way: The chloride pitch is mixed with water in a large tank provided with a direct steam-coil. Steam is blown in, and the mixture boiled for a short time. The pitch is liquefied, and the chloride goes into solution. The pitch will sink to the bottom, and can be drawn off while hot and the chloride liquor decanted separately. A sufficient amount of water must be used to keep the solution so dilute that its specific gravity is such as will allow of the easy separation of the pitch from the liquor. The solution so obtained is mixed with the condensed liquor from the washer and concentrated in the usual way.

The temperature of extraction of the fixed ammonia should not be allowed to fall below about 90° to 95° C., in order to prevent the absorption of free ammonia by the liquor. The free ammonia consists chiefly of ammonium carbonate and ammonium sulphide, both of which dissociate at about the temperature indicated. It is advisable, however, to concentrate chloride liquor in a vessel provided with a connection to the gas-main, so that any free ammonia which may have been absorbed by the liquor is ultimately recovered. When the liquor is sufficiently concentrated, it is run off into crystallizing tanks—being first filtered if necessary. The ammonium chloride crystals so obtained are usually dark brown in colour, and the salt is of a crude nature. To purify it further, re-solution, filtration, and fractional crystallization are necessary. The demand for ammonium chloride is comparatively limited, and there is by no means the same outlet for it as there is for sulphate. The compound is, moreover, a bye-product of the ammonia-soda process for the manufacture of sodium carbonate; and the market is therefore largely controlled by the makers of this product.

Since the commencement of the war, manufacturers of sulphate of ammonia have been badly handicapped—partly on account of the poor quality of sulphuric acid available, but more especially because of the difficulty of getting supplies of acid at all. Shipping difficulties have led to the curtailment of supplies of pyrites from abroad, and large quantities of arsenical pyrites have had to be used. From this material inferior acid is manufactured, which brings about discoloration of the sulphate. On account of the great pressure put upon acid makers, it has not been possible to produce an arsenic-free acid. The difficulty can be partly overcome by treating the acid at the coke-works. The effluent gases from the ammonia still containing a large proportion of sulphuretted hydrogen are passed through the acid, precipitating the arsenic as sulphide; the precipitate being removed by filtering the acid through porous slabs. Another method has been suggested by means of which the arsenic can be partially eliminated. A bucketful of thin tar is added to the mother liquor in the saturator, and this picks up the precipitated arsenic

* For previous articles of the series, see *ante*, pp. 126, 174, 291, 336, 389.

sulphide and forms with it a scum which floats on the surface of the mother liquor and can be removed from time to time.

In case of shortage of acid, some alternative form of recovery has to be adopted, and several coke-oven plants are manufacturing concentrated ammonia liquor instead of sulphate. Two grades of liquor are produced—(1) containing 15 per cent. of free ammonia, principally in the form of carbonate and sulphide; (2) containing 25 per cent. of free ammonia, principally in the form of ammonium hydrate. It is usual in the case of the latter to restrict the amount of sulphide present to a very low figure. In cases where the indirect method of recovery is in use, little additional apparatus is required to adapt the plant for the manufacture of concentrated liquor. With direct and semi-direct recovery, coolers and scrubbers are necessary, as the whole of the ammonia must be obtained in the form of ammoniacal liquor. This liquor is distilled in the usual way; the vapours passing from the still being condensed by a water-cooled condenser.

These vapours consist of ammonia, carbon dioxide, and sulphuretted hydrogen in the same proportions as they existed in the original liquor, together with steam. The amount of steam allowed to pass over must be so regulated as to provide sufficient water to make, with the ammonia, 15 per cent. liquor. This regulation is obtained by passing the vapours through a water-cooled reflux condenser; and the temperature at the outlet of this must be carefully watched. If it is too low, insufficient steam may pass forward, and the liquor will then be too strong. If too high, too much steam will pass forward and result in the production of weak liquor. It is not desirable with this apparatus to attempt to produce a stronger liquor than 15 per cent. As already pointed out, the liquor contains a large proportion of ammonium carbonate; and the saturation strength of a solution of this body corresponds to about 17 per cent. of ammonia at 15° C. There is always a danger of crystallization taking place in the condenser coils, ultimately causing a blockage. Should such blockage occur, it is best removed by stopping the liquor feed to the still and allowing the condenser to become warm, when the deposit will soon dissolve. It is essential that the condensation should be gradual, as sudden cooling frequently produces deposits.

For the manufacture of 25 per cent. liquor, because of the tendency of ammonium carbonate to crystallize, it is necessary to eliminate practically the whole of the carbon dioxide and sulphuretted hydrogen, and to obtain the ammonia as ammonium hydrate. This elimination can be done in two ways. By preheating the liquor in a column still to about 95° C., the CO_2 and H_2S are driven off, while the ammonia remains in solution; and the liquor is then distilled as before—further restricting the amount of steam which is allowed to condense. The gases issuing from the preheater are drawn by means of the exhauster back into the scrubbers, so that any ammonia which may be driven off is again recovered. The CO_2 and H_2S can also be removed by precipitation as carbonate, and sulphide of calcium by means of lime. Milk of lime is added to the cold liquor prior to distillation, the precipitated calcium carbonate allowed to settle, and the clear liquor then distilled. The vapours from the still are then passed into a washer, containing milk of lime, heated by means of a steam-coil, where the remainder of the CO_2 and H_2S is eliminated. In one or two cases, the process of manufacture has been carried a stage further, and pure ammonia manufactured. For this purpose, further purification is necessary for the removal of pyridine and other organic impurities.

A GAUFFRETTE GAS-COOKER.

In the current issue of the "Journal des Usines à Gaz" is described the latest type of gas-stove for the baking of "gauffrettes," the popular light honeycomb pastries familiar to visitors to outdoor pleasure resorts in France, and possibly destined as the outcome of the sojourn of British troops on French soil, to come into general favour in this country.

The gauffrette cooker consists of a large cast-iron drum (stood on its rim) with a flat top, in which is an opening which can be closed by a plate, and is provided on each side with a square shelf or platform. Within the drum, and mounted on a central horizontal axis, is an octagonal frame; each of the eight sides carrying a mould for one "gauffrette." This inner frame is rotated at such a speed that the contents of a mould get from 7 to 8 minutes' cooking in traversing the drum, including the eight stops made for the purpose of removing the gauffrette from the mould and recharging the latter with paste, which is done at the top of the drum. The operation of a single lever disengages the rotating gear and raises the cover of the aperture in the upper surface of the drum; the opposite motion of the lever closing the aperture and re-starting the octagonal frame.

The moulds are heated by atmospheric burners from both above and below; all eight being rotated between two envelopes of flame, the power of which can be adjusted to a nicety by the taps on the circular upright face of the drum. Such exact adjustment is of the first importance, and gas is the only fuel which can be used. With the new installation above described, some 440 lbs. of gauffrettes are baked in nine hours, with a consumption of less than 300 cubic feet of gas.

MEASURING DENSITIES OF FLUIDS.

A Rapid Balance Method.

A recent paper before the French Academy of Sciences by M. C. Cheneveau is reprinted in the current issue of the "Journal des Usines à Gaz." It describes a new method of measuring the density of fluids which requires a very small quantity (about one fluid ounce) of the sample, is very quickly carried out, and yields results of satisfactory accuracy.

The principle of the method is the use of a bent beam which, by a balancing weight, is brought into equilibrium with the weight of a glass float (of about 10 c.c. volume) immersed in the fluid to be tested. To one end of the beam is attached a pan; to the other, a finger which moves over a scale of one hundred equal divisions, the limits of which represent the position of equilibrium in air (0) or in water at 60° Fahr. (1).

From the theory of the balance is derived the formula according to which, when the float is immersed in a fluid of density D, the angle of inclination a of the beam is such that

$$D = \frac{A}{\frac{B}{\tan a} + C} \qquad (1)$$

The ratio of the density D to the arc Ra which supplies a measure of it may be expressed:

$$\frac{D}{R\,a} = \frac{1}{R} \times \frac{D}{\tan a} \times \frac{\tan a}{a}$$

where R is the length of the balance arm carrying the finger. But according to equation (1) the ratio $\frac{D}{\tan a}$ increases with a, whereas $\frac{\tan a}{a}$ becomes smaller as a is greater. Thus for a suitable total angular displacement, the readings of the instrument will be proportional to the densities where an error of ·01 or ·005 is permissible. The divided scale which serves for densities from 0 to 1 serves also for those from 1 to 2 and 2 to 2·5 by adding for each new part of the scale a weight of 10 grammes on the side carrying the float.

If a degree of accuracy of 1 in 1000 is wanted, the scale, as shown by theory and experiment, requires to be read towards one end or the other, but can be made to give strictly correct readings in the middle portion by substituting for one of the 10-gramme weights a mass differing slightly from it, in order to produce equilibrium.

The instrument is thus very simple in use. The manipulation consists in placing in the pan a weight which gives the figure in the unit place. The position of the needle on the scale then indicates the decimal portion. When provided with a large scale, the instrument serves for the regular measurement of fluids differing widely in density—including very viscous liquids such as oils or glycerine. The same apparatus may also be employed to measure the density of solid bodies by first placing the body in the pan and then suspending it by a hair in water on the float side; taking a reading in each position. With a substance of density 3, the result will be correct within ·01.

Alleged Decline of the Gas-Engine.—Dealing with this subject the journal "Power" (New York) says that probably the greatest factor in the decline of the gas-engine has been the rapid development of the steam-turbine in all sizes and types. Managers of plants are attracted by the low first cost, the increasingly high steam economy, the uniform reliability, and the simplicity of operation of the modern steam-turbine.

Peat for Producer Gas Plants.—It was pointed out by Professor E. C. C. Baly, in a paper read before the Liverpool Section of the Society of Chemical Industry, that the essential difficulty in the utilization of peat in producer gas plants is to be found in its enormous bulk in relation to its thermal efficiency. Add to this the very high water-content of freshly-cut peat, and the trouble and peculiar difficulties involved in its effective drying, and the failures which had been reported were such as any modern man of science would fully have expected. He had the opportunity a few weeks ago of inspecting a works in Ireland the motive power for which was obtained from engines supplied with gas obtained from producers fed with peat. Although the works were small, the economy was so obvious that he had felt it worth while to find out what had been done in other countries; and no doubt whatever was left in his mind that the utilization of peat in gas-producer plant had been carried out, and was being carried out, so economically as to make him feel that it was necessary entirely to alter one's ideas of the value of peat bogs. The suction plant at Portadown to which he had alluded had been in use for five years. It was as simple as possible in design; and no effort was made to recover any of the bye-products. Figures obtained in 1912 showed the cost of running per week on coal to be £31 0s. 6d., and on peat £15 15s. In addition to this, it had to be remembered that the bye-products from peat producer gas were peculiarly valuable, especially when Irish peat was used, owing to the relatively high percentage of nitrogen in the peat.

POWER PRODUCTION.

THE "MONEY SIDE" OF TOWN'S GAS AND PRODUCER GAS INSTALLATIONS.

By "M.J.Inst.E."

(*Continued from p.* 389.

Fuel Charges.

The calorific value of the gas generated in a suction type of producer plant varies according to the load on the engine—an average value when working full load on anthracite fuel being from 130 to 135 B.Th.U. per cubic foot; the latter figure being the basis on which engines for working in conjunction with producer gas plants are rated. On light loads, however, the heat value of this gas may vary by about 20 per cent. or even more; so that it follows that at such periods a suction-gas plant must necessarily be inefficient.

Comparing these figures with the usual calorific value of town's gas, it will be seen that, in order to produce a given power, it will be necessary to use at least four to five times the volume of such gases that would be necessary with the same engine operating on town's gas.

In the case of engines operating on town's gas it is usual to state the efficiency in terms of either British thermal units or cubic feet of gas per brake-horse-power-hour; but the standard adopted by the makers of engines intended to work on producer gas is the more convenient one (having regard to the method of gas production) of pounds of fuel fired into the producer per brake-horse-power-hour.

Taking the consumption figures of a prominent firm of gas-engine manufacturers, it is seen that the consumption of (say) a 40 B.H.P. engine, working on an anthracite fired producer, is expressed as follows:

Full load	0·82 lb. fuel per B.H.P. hour
Three-quarters load . .	0·95 ,, ,,
Half load	1·15 ,, ,,

These consumptions, it must be borne in mind, do not include stand-by losses, and are based on the assumption that the anthracite fuel employed has a heat value of 14,800 B.Th.U. per pound. Now, while these consumptions have no doubt been obtained on test plates, there is no reason why they should not be attained in actual practice, provided that the load on the engine was of that same unvarying nature which is the usual characteristic of a manufacturer's loading on the test plate. In practice, however, such loads are rarely obtained, particularly in that class of power-using establishments which help to form the usual power load of a gas undertaking; and in estimating the fuel consumption, it is usual to take a much higher figure, in view of the effect which a falling off in the plant load factor has upon the economy of producer-gas plants.

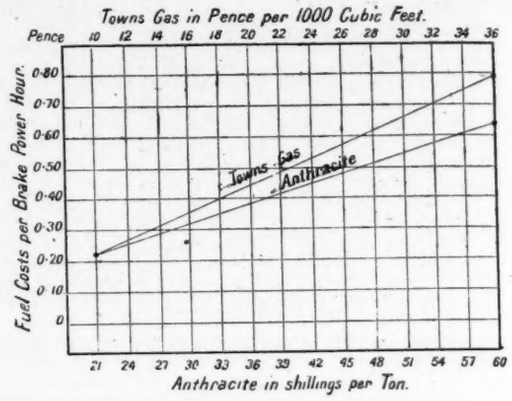
It is by no means an easy matter to determine the actual plant load factor of any particular plant, especially in the case of a new job; but it may be mentioned that a load factor of 50 to 60 per cent. is a good average on which to base an estimate. Then, again, the extent and frequency of the load variations which go to make up this average figure have an important bearing upon the matter. A safe figure which is frequently used in determining the probable consumption of the average moderate sized industrial plant is 1¾ to 2 lbs. of anthracite fuel per brake-horse-power-hour, or about 3 lbs. per kilowatt hour in the case of an electric generating plant. This figure, including as it does stand-by losses, is by no means an unfair one, having regard to the usual poor load factor existing in small factories, and may be used without fear of either doing an injustice to the producer plant or of invoking the adverse criticism of people who are conversant with these matters.

On power using installations, where special conditions of loading, or where, for example, the driving of electrical generators in parallel with batteries of accumulators provide an especially steady load, this figure may be amended; but for the average case it is a safe one. In order to provide a basis of comparison, let us select an 80 B.H.P. gas-engine running on a modern suction-gas producer plant.

If this were run on town's gas of an average calorific value, and under the plant load factor mentioned above—namely, an average of 50 to 60 per cent.—the consumption would be about 22 cubic feet per brake-horse-power-hour; and the curves in fig. 1 have been compiled with a view to showing the relative costs of running this engine on (1) suction gas from an anthracite fired producer and (2) town's gas, at rates varying from 21s. to 60s. per ton for anthracite, and 10d. to 3s. per 1000 cubic feet for town's gas.

Capital Charges.

The actual working costs per brake-horse-power-hour must, of course, take into account interest, depreciation, and maintenance charges in respect to both the engine and the producer plant. As has already been pointed out, much of the success of a producer-gas plant depends upon the maintenance of a good steady plant load factor. Before a new plant generates a single unit of power, it is handicapped by capital charges; and the nearer it can be run to the maximum safe load, and the greater the number of hours it can be run at that load, the less will be the effect of such


Towns Gas in Pence per 1000 Cubic Feet.
Pence 10 12 14 16 18 20 22 24 26 28 30 32 34 36
Fuel Costs per Brake Power Hour.
0·80 0·70 0·60 0·50 0·40 0·30 0·20 0·10 0
Towns Gas
Anthracite
21 24 27 30 33 36 39 42 45 48 51 54 57 60
Anthracite in shillings per Ton.

Basis:	Capacity of plant	80 B.H.P.
	Average plant load factor . . .	50 to 60 per cent.
	Efficiency of producer gas installation	2 lbs. of anthracite per B.H.P. hour.
	Efficiency of town's gas installation	22 cub. ft. per B.H.P. hour.

Fig. 1.

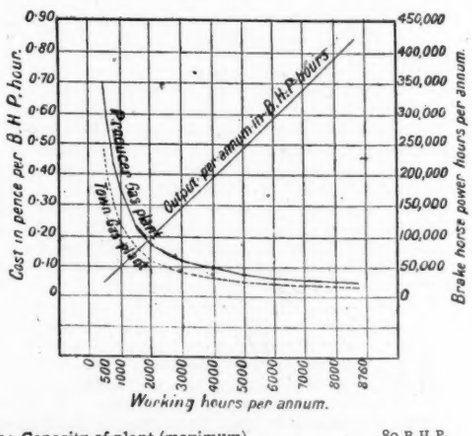
charges in regard to the total cost per unit of power produced. Hence it follows that the more accessories a plant has the greater will be the initial handicap imposed by the consequently increased capital charges; and it frequently happens in power plant design that it is found that the increased efficiency which would result from the adoption of some certain accessory is more than wiped-out by the increased capital charges which the outlay upon it would involve.

As a suitable example, let us take the case of the 80 B.H.P. producer-gas plant to which reference has already been made. Assume, for the purposes of argument, that this plant could be run day and night under full load. Under these conditions, the plant would be capable of an annual output of 700,800 B.H.P. hours, or about 480,000 B.o.T.U. if used for the purposes of electrical generation.

To base any calculations upon pre-war prices would certainly detract from any value which this article may possess; and in dealing closely with the question of capital charges, the author proposes to take as a basis a quotation with which he dealt about two months ago for an installation of the capacity mentioned—namely, 80 B.H.P. The cost of this plant erected complete and set to work was £700. On the assumption that this plant could be run continuously under full load, and allowing 5 per cent. for interest and 5 per cent. for depreciation, the cost per brake-horse-power-hour, as created by capital charges alone apart from all other costs, would amount to 0·024d.

These conditions of load factor and hours of operation are, of course, impracticable. But let us take the case of this same set running 54 hours per week at a 60 per cent. load factor. Under these conditions the annual output would be 134,784 brake-horse-power-hours, while the cost incurred by capital charges would amount to ·125d. per brake-horse-power-hour, as against ·024d. if it were possible to take the very fullest advantage of the capacity of the plant.

While the capital charges are fixed debits against the working costs of a plant, the charge for maintenance will vary with local conditions, hours of running, and on the manner in which the plant is handled. Assuming that a 60 per cent. load factor is fairly representative of the conditions of loading in most moderate sized industrial factories, the curves in fig. 2 have been prepared in

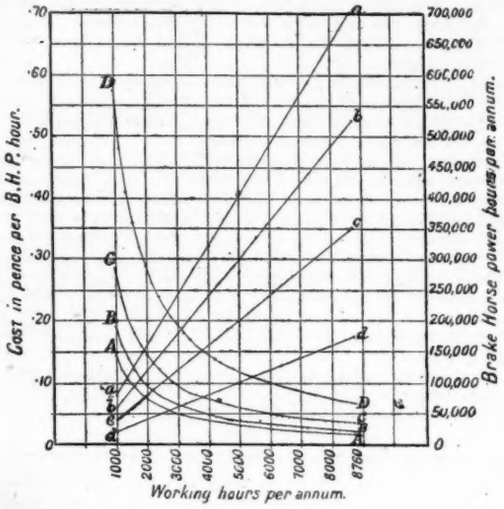


Basis:	Capacity of plant (maximum)	80 B.H.P.
	Plant load factor	60 per cent.

Fig. 2.—Diagram Showing the Proportion of the Power Production, Costs for which Capital Charges are Responsible.

order to show the relationship between the effect of capital and maintenance charges on the costs per brake-horse-power-hour and the hours at which the plant is run under this load factor.

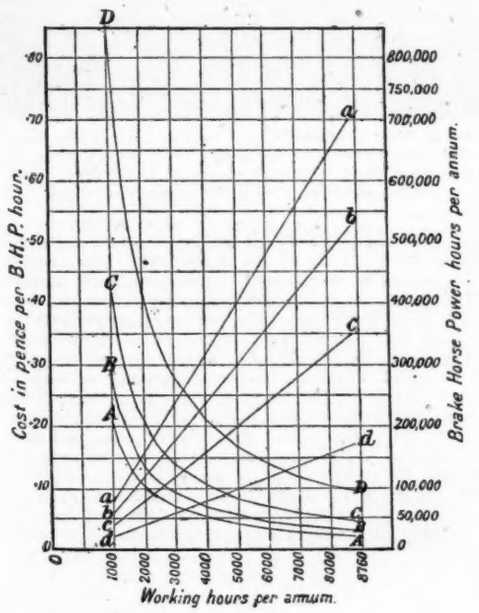
It will be noted that a dotted line generally following the contour of the main curve is also shown. This line represents the same charges in respect to an engine of equal capacity—namely, 80 B.H.P.—running under these same conditions on town's gas, in which case the only accessory required is a meter. The initial expenditure on which these latter charges are based is not only less by the amount representing the difference in cost between a gas-meter and an installed producer plant, but takes into account the fact that the engine itself would cost less. It is a well-known fact that any gas-engine will give from 15 to 20 per cent. more power when running on town's gas of average calorific value than it would be capable of producing when worked in conjunction with a producer plant. In other words, if an engine rated for working on a town's gas supply is laid down to run on suction gas, the capacity of the engine is reduced by about 20 per cent. on account of the fact that the mean effective pressure obtainable with the latter fuel is less than that given by town's gas. Having regard to the closely graded capacities of the standard engines manufactured to meet the requirements of the trade, it is generally possible to put down a size smaller machine for working on a town's supply than it would be possible to use in connection with a producer plant.



Curve AA represents costs at full load.
" BB " " three-quarters load.
" CC " " half load.
" DD " " quarter load.

Line *aa* represents output per annum at full load.
" *bb* " " " three-quarters load.
" *cc* " " " half load.
" *dd* " " " quarter load.

Fig. 3.—Diagram Showing the Costs per B.H.P. Hour for which Capital Charges alone are Responsible in the Case of an 80 B.H.P. Town's Gas Installation at Quarter, Half, Three-Quarters, and Full Load and at Various Hours of Running per Annum.



Curve AA represents costs at full load.
" BB " " three-quarters load.
" CC " " half load.
" DD " " quarter load.

Line *aa* represents output per annum at full load.
" *bb* " " " three-quarters load.
" *cc* " " " half load.
" *dd* " " " quarter load.

Fig. 4.—Diagram Showing the Costs per B.H.P. Hour for which Capital Charges alone are Responsible in the case of an 80 B.H.P. Producer Gas Plant at Quarter, Half, Three-Quarters, and Full Load and at Various Hours of Running per Annum.

In order to further illustrate the effect which the extent of loading and the annual hours of running have upon the portion of the running costs for which capital charges are responsible, figs. 3 and 4 have been prepared. These curves relate respectively to an 80 B.H.P. producer-gas installation and to a town's gas installation of similar capacity, and are based upon capital charges alone. The costs per brake-horse-power-hour created by capital charges are plotted as ordinates, and the working hours per annum as abscissæ. Four curves are shown in each figure, representing the costs at quarter, half, three-quarters, and full load respectively; while the straight lines rising towards the right-hand side of the figures represent the annual output in brake-horse-power-hours at these different load factors.

(To be continued.)

COKE-TELPHER DEFECTS AND IMPROVEMENTS.

By E. Davies, of Birmingham.

Although hot-coke transportation by telpherage has been termed a slow process by some gas engineers, many installations have been erected in British gas-works. A few observations, therefore on its defects in working and improvements already made may be of interest.

That it is a "noisy" plant, and on that account a nuisance to the general public where the works are situated in a densely populated district, is a fault that can certainly be minimized. The writer has heard the working of the hoisting gear at a distance exceeding a mile from a gas-works; but surely the use of raw hide or compressed paper spur-pinions or the boxing-in of the wheels would considerably reduce this.

More nerve-racking is the noise produced when the telpher is negotiating the track curves during dry weather. In some works grease has been tried as a remedy—being placed on the sides of the bulb of the curve rail—but with disastrous effect on the foot-brake of the travelling gear, all control of which was lost by the brake-block slipping on the greasy wheels. Telpher manufacturers now equip their plant with a water-spraying device, which has been found to be an effective silencer.

The matter of skip coke-quenching has caused grave concern to telpher users; being either overdone or underdone—the former causing serious complaints from coke buyers and the latter leading to coke-stack fires. A skip was made last year by an engineering firm, with two intermediate divisions, making a skip of three compartments. The divisions were composed of flats, with intervening spaces, similar to the body of the skip, and of an inverted V shape; so that, when dipped in the tank, the water got at the centre of the skip's contents. This proved satisfactory, though the design slightly reduced the skip's load-capacity.

The rapid wasting away of the tank grid has led to various materials being tried for economy in its upkeep—including mild-steel flat bars, sheets of fine mesh expanded metal, and galvanized wire sheets of ½ inch diameter by ¾ inch square mesh. The latter has proved the most durable of the three.

The corrosive action of the clouds of steam vapour rising from the quenching tank renders it necessary to annually give the overhead steel work of the track in the tank's immediate vicinity a coat of "humid" paint to preserve it.

The short life of the wire ropes is one of the costliest items of telpher maintenance; and although expert rope-makers have recommended ropes of varying textures and strands, the working period has not been much prolonged—the strands giving out generally within the first 3 feet from the attachments on the bale channels. Seeing that human life is at stake underneath, it is good practice to insist on an examination being made once on each shift and any defect reported.

In exceptionally wet weather or during snowstorms, the telpher is frequently thrown out of action through the earthing of the insulators supporting the overhead trolley wire in the coke yard, which seem to act as the draining point for the top portion of the steel trestles and track structure. Those of the dome-shape composition type give the worst results; while the porcelain cylindrical type seem too brittle to withstand the vibration.

The Electrical Engineer to the Birmingham Corporation Gas Department has recently been giving this matter attention and is introducing insulators which will undoubtedly be more serviceable than those above-mentioned.

A PROBLEM IN SUPPLY.

By JOHN MACKENZIE, the Engineer of the City of Newcastle (N.S.W.) Gas and Coke Company, Limited.

THE town of Stockton (N.S.W.) is situated near the extremity of a peninsula which forms the north side of the entrance to Newcastle harbour, and the mouth of the Hunter River. Since the closing of the Stockton Colliery, some eight or nine years ago, the district has become a favourite residential suburb of Newcastle; but its growth had been much retarded by the absence of proper street lighting and gas supply.

Twenty years or so ago, the idea of supplying Stockton with gas was first mooted; and some years later the then Directors of the City of Newcastle Gas and Company, Limited, purchased land there, with the object of erecting at some time a separate works to supply the district. On various occasions the scheme was examined and reported upon by the then Engineer of the Company (Mr. Thomas Reid), and by the writer; but the high working expenses always proved a barrier to the supply of gas comparable in price to that furnished to the City of Newcastle,

Submarine Main being hauled into position. The South Wave Trap can be seen in the distance where the Winch was fixed.

separated only by the width of the river. The question of a direct supply to Stockton by means of a submarine main had been mentioned and reported upon from time to time; but nothing definite was decided until after the writer's return, early in 1914, from England, where he had been on a visit. The Directors in that year approved of a scheme submitted by the writer, which has resulted in Stockton being supplied with gas direct from the Company's mains in Newcastle.

The scheme includes a 6-inch steel main about 2 miles long, laid from the gasholder station in Newcastle to the South Wave Trap, and two 3-inch steel submarine mains, laid 1 chain apart, from this point to the peninsula. Both these mains are separately connected with the 6-inch steel main, and with a 6-inch cast-iron main on the Stockton side, from which the gas is fed at holder pressure through a 6-inch Reynolds governor to the distributing mains in the new district. As the demand increases, it may be necessary, later on, to use some mechanical method of raising the pressure. By means of valves, either submarine main can be isolated, while the other continues the supply, and the condensed water removed in the manner described later on. The submarine part of this scheme is probably the only portion of the work which calls for any special description, as the writer believes it embodies some new features.

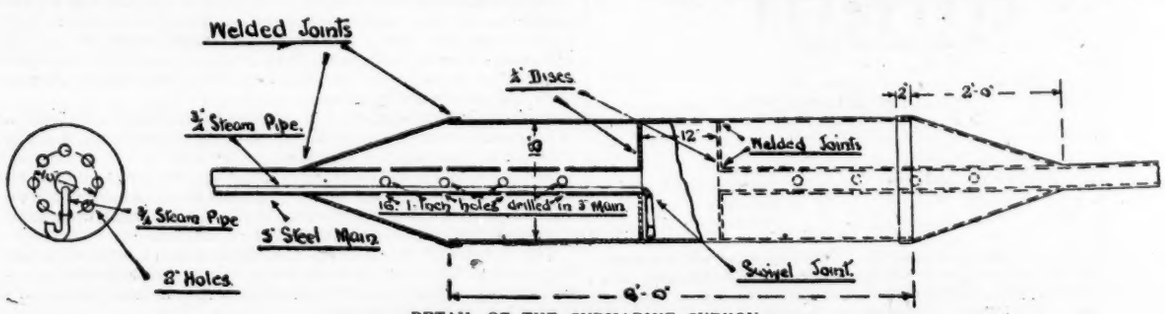
Permission was sought and obtained from the Public Works Department of New South Wales to carry out the work in the bed of the stream between two points within which, the Company were advised, there would be no likelihood of disturbance later on through dredging or harbour improvements, and where the possibility of a ship having to drop an anchor was extremely unlikely, and was practically unknown. But by keeping the two mains apart, the supply was further safeguarded, inasmuch as any interfering object was not likely to injure both. Apart from the conditions laid down by the Public Works Department, there had to be no interference with the shipping passing in and out of the harbour; but the Navigation Department gave the Company all assistance while the work was being carried out.

The tides at the selected points attain a speed of 6 feet per second; while periodical floods bring a strong scour at ebb tide. After a storm on the coast, there is always a heavy range in the harbour. The above are a few of the adverse conditions which were foreseen. In the course of the work, however, difficulties arose which could not be anticipated, but these were all satisfactorily overcome.

Accurate soundings and prickings were obtained from the Public Works Departments of the bed of the stream taken just prior to laying the pipes—the deepest part being 42 feet L.W.S.T. The bed of the stream consists of a shelf of rock running 400 feet out from the South Wave Trap; the remainder of the distance being sand and silt. It was found that to cut a trench and lay the pipe in it would be impracticable, owing to the continually shifting sand; and therefore it was decided to lay the pipe on the bottom, allowing it to cut its own trench in the laying. A recent report from the diver shows that the pipes are now quite covered with sand. The mains employed were the ordinary 3-inch steel pipes made by Messrs. Stewarts and Lloyds; the joints under water being in every case oxy-acetylene welded. The pipes were protected from the action of sea water by three layers of Hessian soaked in a mixture of tar and bitumen, and applied hot. To prevent the coating from being rubbed off by the constant motion of the sand, the pipes were further covered with 4½ in. by ½ in. (hard wood) battens, fastened by galvanized clips.

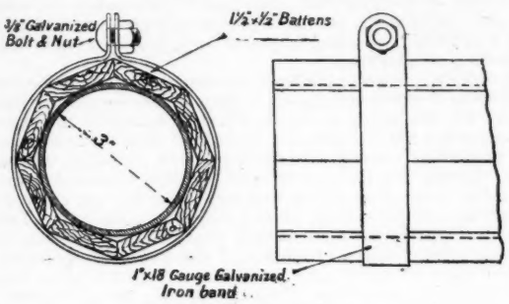
Submarine Main, looking back from the River. The Main was like, and behaved like, a big cable when it was being hauled into position. Note the rough nature of the ground, which had to be partly levelled before operations began.

The difficulty of removing the condensed water from the mains was overcome by the use of the double main and a special form of syphon, whereby, no matter in what position it came to rest when laying the main, the syphon would always be workable. The water is removed by isolating the main and blowing the water out through the internal pipe by means of air pressure. The syphon is made of a piece of 18-inch steel pipe tapered at the ends to suit the main. There are two compartments, separated by two perforated discs; the two ends of the pipe passing through to, and being welded on to, these discs. The perforations are made close up to the 3-inch pipe. Between the discs and the end of the syphon, the 3-inch pipe has holes staggered round the circumference, for condensation to drop through. A ¾-inch tube for removing the water passes through inside the 3-inch pipe, and terminates in the middle compartment of the syphon, where the water collects after overflowing through the disc-holes. The



DETAIL OF THE SUBMARINE SYPHON.

reason for this is to retain any sediment which may be washed down the main in one compartment of the syphon, and to prevent it blocking the ¾-inch pipe when removing the water.



Detail of the Pipe Covering.

The main was welded-up its entire length on the Stockton side, along with the syphon, and the internal pipe fixed. This was done immediately behind, and in line with, the points between which it was to be laid. The main was then tested with water to 100 lbs. per square inch, and every part carefully examined. After the testing, it was coated and covered with the hard wood battens, and lowered on to rollers ready to be put in position. While this work was proceeding, a 2-inch steel rope was stretched between the two points in the stream at slack water, and carefully straightened, so that rope and pipe were all in line. The rope was connected to a 5-ton hand-winch on the Newcastle side; the other end fastened to the main. It was calculated that three men on the winch should comfortably haul the load; and if they could not, then something would be wrong and require attention.

The main, having been filled with water, was then hauled across, making its own bed in the sand. The hauling was done for about an hour at slack water each day until the main was in position. So accurate were the soundings and distances that the syphon came exactly at the lowest point. As soon as possible after the pipe was laid, the diver got to work and fastened old ¾-inch chain the full length of the pipe, to prevent further movement. The water was then blown out of the main, and gas admitted. The other main was laid in a similar manner, but with minor improvements gained by experience.

By arrangement with the Navigation Department, a large notice board has been erected, along with prominent guide discs, to indicate and warn shipping of the position of the mains. Gas has been supplied to Stockton since last February; and, beyond a few initial difficulties, everything has proved very satisfactory.

THE DEMAND FOR GAS.

By Thos. Newton.

The unprecedented industrial activity that is so much in evidence on every hand has, on the whole, undoubtedly re-acted favourably in the interests of gas as a source of heat, light, and power. It is, however, somewhat unfortunate that the operations of the "Summer Time Act," and the various orders which have been issued from time to time by the Home Secretary under the Defence of the Realm (Consolidation) Regulations, as to lights in England and Wales, coincided with the maximum demand for gas for industrial purposes, inasmuch as the effect of these operations has been to render a comparative statement more or less futile. It would have been highly instructive, for instance, to have ascertained what the industrial demand represented in terms of cubic feet of gas; and it would also have been instructive to have known what saving has been effected by the operation of the Summer Time Act. The war has brought home to us many lessons; and so far as the gas industry is concerned, it has demonstrated the possibilities of gas for industrial purposes to an unusual extent.

Prospective Demand for Gas for Industrial Purposes.

There is abundant evidence that the permanent demand for gas for industrial purposes is now fully assured. Not only has it more than held its own in competition with other forms of energy as regards heat and power—it has also proved to be superior in many other important respects, and particularly from the standpoint of dependability, convenience, and economy. Gas has been subjected to many novel applications in modern industry; and it is no exaggeration to state that it has yielded uniformly satisfactory results to all concerned. Its efficiency is unquestioned; and by its use temperature is brought under complete control with comparative ease.

In the anticipated industrial development that will take place after the war, gas will undoubtedly play a most important part. Hitherto, in times of peace, its application to industrial processes has been somewhat retarded by the innate conservatism of manufacturers; but this condition of things is now rapidly passing away. Formerly, manufacturers were contented with the limitations imposed upon them by their predecessors. Wasteful and antiquated methods of applying heat and power were handed down from one generation to another. Legacies of crude and ill-designed apparatus, inefficient processes, and wasteful prime movers were transmitted from manufacturers to their successors; and this had the inevitable effect of stereotyping methods of manufacture that were hopelessly out of date. When it became apparent that an economical and accelerated production of commodities was a paramount necessity, an opportunity at once presented itself of displaying the advantages of gas as a fuel and as a source of power. It is scarcely necessary to add that this opportunity was readily seized; and the nation is now reaping the benefit. After what has already happened, and after experiencing the advantages and economies which have resulted as a direct consequence of using gas for industrial purposes, it is hardly likely that manufacturers will revert to the old wasteful methods of the past. The coming industrial development and reorganization will make it incumbent on all progressive manufacturers to avail themselves of proved methods of efficiency and economy. Hence an increased demand for gas for industrial purposes can be confidently anticipated in the future.

The industrial use of gas is not yet fully appreciated; and it has been reserved for a devastating war to teach our manufacturers in a couple of years what they would not otherwise have learnt in a couple of decades. From sheer necessity's sake, under the stimulus of war, gas is rapidly assuming its rightful position as a source of energy of first-class importance; and the splendid results already obtained are an earnest of its ultimate triumph. When contemplating the future possibilities of gas in this connection, it should not be forgotten that the prospects immediately ahead are much brighter than the, to some extent, experimental experiences of the past.

The application of gas as a source of energy having succeeded thus far, in spite of prejudice and that antagonistic atmosphere which invariably surrounds a new rival, it is only reasonable to assume that its ultimate success cannot be long deferred. Moreover, if gas can be successfully utilized in connection with old-fashioned arrangements, plants, and apparatus designed primarily for use in connection with other sources of energy, it is also reasonable to assume that in the forthcoming industrial reorganization, and with modern plant and apparatus specially designed for the use of gas in its most effective manner, it will readily win its ever-widening way. The industrial application of gas which to-day is considered to be novel, will then become normal; and it is difficult to predict or estimate the future limitations of its sphere of usefulness.

Restricted Building Developments.

The demand for gas has proceeded apace, notwithstanding the restrictions imposed by the Government on building developments. The cause of these necessary restrictions is, of course, thoroughly well appreciated; but the mere mention of the restrictions on building only serves to indicate the leeway that will inevitably have to be made up when the times are propitious. For the moment, the output of gas is adversely affected on this account, not only as regards lighting, and heating, but also for power purposes. Yet this, in the long run, may prove to be not disadvantageous, especially when it is remembered that present experiences in the successful application of gas will undoubtedly be turned to good account later on. The ultimate gain will assuredly more than compensate for apparent momentary disadvantage.

The Prospects of the Future Demand for Gas.

When once the cessation of hostilities is in sight, the aggregate demand for gas is likely to be considerably increased. The removal of lighting restrictions and building restrictions will synchronize with industrial and social developments of a far-reaching character. A multitude of housing schemes will, in all probability, appear throughout the length and breadth of the country, and war-like activities will be diverted into the peaceful channels of modernizing old, and building new, factories and workshops, wherein, it is hoped, we shall far surpass our former industrial pre-eminence. The growing popularity and proved efficiency of gas-fires, cookers, and other domestic gas apparatus, together with the reaction in favour of a great extension of artificial lighting—private, public, and industrial—as well as the industrial demand for heat and power purposes, all unite to form good and tangible prospects of a vast aggregate future demand for gas.

The possibilities involved are enormous, and much will depend on the spirit animating both master and man when the occasion arises. A mutual spirit of harmony, confideuce, and goodwill, will secure much good business and lasting benefit to the gas industry as a whole, and to those who are directly or indirectly concerned in it. The formation of the National Gas Council at this juncture is a happy augury; and it may be trusted to keep a watchful eye upon the prospective developments foreshadowed above. If it could also, incidentally, embue those engaged in the gas industry with a spirit of harmony and goodwill, and so create a common bond between all classes, encouraging all to work together in the best interests of the industry, it would perhaps be attempting something that lies outside the ambit of its specific activities; but it would nevertheless confer a lasting benefit on the industry as a whole, and it would also deserve the thanks of all concerned.

AMERICAN GAS INSTITUTE MEETING.

The notice given last week [p. 386] of papers presented in the Manufacturing and Chemical Sections at the recent annual meeting of the American Gas Institute may now be followed by similar treatment of the Presidential Address and the papers in the Distribution Section.

The Presidential Address.

The first portion of the Presidential Address of Mr. William E. M'Kay [the full text of which is now to hand] was naturally devoted to the war, which has completely subordinated individual and local interests to national requirements. This diversion of activities from the highways of peace into the channels of war, and the cumulative effects of devastating conflict, have, he declared, been manifest, not only in the countries at war, but everywhere else throughout the world. Each day brings new cause for the re-adjustment of outlook, made necessary by the progressive alteration of basic conditions; and not even the restoration of peace will allow of the re-establishment of the *ante-bellum* circumstances of labour and industry. As proof of the fact that the experience of the war has shown that gas properties are a national asset of prime military value, attention was drawn to the enormous quantities of high explosives required in modern warfare. It is, the President said, stated that in England alone the present daily make of nitrate of ammonia is 600,000 lbs. Many hundreds of European gas companies are now recovering benzol and toluol; and to meet the extraordinary demand, bye-product coke-oven plants in the United States will this year have an output of many millions of gallons of these products. Taking another standpoint, gas making was viewed as a process of conservation; allusion being made to the proposal, noticed in the "JOURNAL" some weeks ago, that a huge sum should be spent on Government plant for the production of nitrates, and to the necessity for the Institute to demonstrate to the authorities the potential economy of fully utilizing the existing gas and coke plants. In the field of agriculture, remarked Mr. M'Kay, the ammonia of the gas industry is serving the needs of peace; and its conversion into nitric acid to serve the needs of war is facile, reasonable, and economical.

Reference was made to the unsatisfactory labour position, wages being higher though work is less, and to the high price of coal and other materials, which, even at enhanced cost, are not everywhere abundantly procurable. The members were told that gas is not yet in step with the upward march of the cost of living. For a hundred years, the industry has successfully striven to give better service, and ever at lower prices. It may be necessary to re-adjust the perspective, and to make united efforts for the maintenance of satisfactory service at higher prices. It is the time for better and closer co-operation with each other and with the customers, among the companies, between the associations, and with the State and Federal regulating bodies.

The excellent work of the Institute, which has abundantly justified the expectations of its founders, formed the President's next topic; and he was able to produce some striking figures. Since 1906, it appears, the income has doubled; while the membership has increased from 1215 in 1907 to 1525 in 1915. The growth of the industry in the States can be gauged from the fact that the census report for 1914 shows, for five years, 35 per cent. increase in the sales of gas (exclusive of coke-oven gas).

Notes on Some of the Papers Read.

DISTRIBUTION SECTION.

The first paper presented to the Distribution Section was on the subject of "Gas *v.* Electric Cooking;" the authors being Messrs. S. C. Bratton and G. D. Mantle, whose object was to show, by a series of unbiassed and many times checked tests, how the cost of gas and electric cooking compares—the comparison revealing a saving of more than 60 per cent. in favour of gas. The paper points out that the figures provided by the monthly bills of similar houses and apartments are unreliable, owing to the fact that the average user of an electric range is so thoroughly impressed with the necessity to be economical, that she does not use it to nearly the extent that the average gas consumer uses hers. Absolute efficiency tests are difficult to make; but the result of a series of careful tests on a modern electric oven gave an average thermal efficiency of 76 per cent., and a similar series on the ovens of three makes of gas-ranges showed an average efficiency of 30 per cent. These tests were so carefully made and checked, that they may be assumed to be correct; and it is therefore possible to arrive at rates which would place gas and electricity on an equal footing when used in modern ovens.

Gas of 600 B.Th.U. value, at $1 per 1000 cubic feet, used in an oven of 30 per cent. efficiency, gives 1800 effective thermal units for 1 c. Electricity at 3 c. per kilowatt hour [3412 B.Th.U.], used in an oven of 76 per cent. efficiency, gives 864 effective thermal units for 1 c. In other words, electricity at 3 c. per kilowatt hour is equal to gas at $2·08 per 1000 cubic feet. This comparison applies only to the oven; the comparative thermal efficiency of the hot plate is even more in favour of gas. An ordinary open aluminium saucepan containing a pint of water was brought to boiling-point from an initial temperature of 56° Fahr., first on the standard element of an electric range, and then on the standard burner of a gas-range. Similar tests were then made with a quart and two quarts of water in the same vessel. The results showed that for boiling a pint of water, electricity at 3 c. per kilowatt hour equals gas at $6·65 per 1000 cubic feet; for a quart, it equals gas at $5·15; and for two quarts, it equals gas at $4·44. In a subsequent test arranged to give the electric element full advantage of the fact that more heat is retained in the electric hot-plate than in the burner and grid of a gas-range, electricity at 3 c. proved to be equal to gas at $2·99 per 1000 cubic feet for simmering operations.

In order to complete the tests, it was necessary to find out what proportion of the operations on a range utilize the oven, or the top burner for simmering or boiling; and to ascertain this, careful records of the gas consumption on each of these items were taken in a number of average households over a period of one week. The following are the proportions: Average total consumption, 490 cubic feet. Operations utilizing the oven, 125 cubic feet; simmering, 260 cubic feet; boiling only, 105 cubic feet. Taking therefore the relative costs already obtained, and dividing them in these proportions, we find that in the all-round operation of the gas-range, electricity at 3 c. per kilowatt hour is equal to gas at $3·2 per 1000 cubic feet. The figures given do not include the heating of any water except that usually heated on the range, as a gas water-heater was employed for all other purposes.

It is, however, pointed out that there are many consumers to whom this difference of cost means little, and convenience everything; and it is these consumers the American gas undertakings are about to lose, unless they realize at once that the appliances they are at present selling are neither as efficient nor as convenient as they might and should be.

"Manufactured Gas for House Heating" was the subject of a paper by Messrs. G. S. Barrows and C. C. Winterstein, who, in dealing with central heating, pointed out that in any system there is some loss in service efficiency because of radiation losses from the conduits for the heating medium. This is not a total loss; for the heat is given up to some part of the house, and is useful. But it is not given as positively to a particular room as where the source of heat is located within the room; and for this reason, individual room-heaters have a decided advantage over a central heating plant. Another advantage of individual heaters is the flexibility of the system taken as a whole, for one or two rooms may be heated as desired. A large number of facts and figures were submitted by the authors, as the result of which they expressed the hope that they had succeeded in showing that the use of gaseous fuel for house heating is perfectly legitimate, but that a more serious effort is necessary on the part of gas companies to develop proper means for its use.

The paper gives a long list of theoretical determinations for coal and gas central house heaters, and tables of relative costs of heat energy supplied by various fuels. Regarding the latter, the authors say that, unless gas is lower or other fuel higher in cost than usual, there is a differential unfavourable to gas, which may be nearly, if not entirely, offset by the advantages of gaseous fuel and the economies of operation. As these are most evident during the seasons when the heating is light or intermittent, it appears obvious to them that there should be an endeavour to introduce gas appliances as auxiliaries to the present appliances, with the recommendation that they be used only during such times in spring and fall as seem to the consumer to be justified by the operating expense and factor of convenience.

That industrial business is awaiting every gas company, large or small, in every city or village, and that this may eventually produce more than 75 per cent. of the total business, was the opinion expressed by Mr. S. Tully Willson, in a paper on "Industrial Gas Appliances." The most important consideration is that the gas be always uniform in quality. Therefore manufacturing conditions should be maintained constant, as this means more to the consumer than high calorific value. A reasonable calorific standard, by permitting the manufacture of a gas free from condensable hydrocarbons, will enable the plant operators to supply a nearly uniform quality at all seasons of the year. The gas which will be eventually demanded is that which will cost the least per heat unit above 212° Fahr. There are very few industrial appliances which save the latent heat in the steam formed by combustion; and eventually this will be a consideration. Combined hydrogen and carbon give a higher flame temperature than either hydrogen or carbon monoxide; and as a high flame temperature is essential for some operations, it is desirable from the industrial engineer's standpoint that the hydrocarbons (other than condensable hydrocarbons) in the gas should be as high as is practicable. Most atmospheric appliances which are used for the direct application of heat will, if properly adjusted, show increasing efficiencies with higher pressures.

Among various other matters, the author dealt with gas and electric heating. Assuming, he said, a gas-heater with an efficiency of only 56·9 per cent., and an electric heater of 100 per cent. efficiency, then 10 cubic feet of gas would equal 1 kilowatt. With gas at $1 per 1000 cubic feet, this would equal electricity at 1 c. per kilowatt hour. As a matter of fact, very much higher efficiencies than this are obtained with gas; and Mr. Treadway, of Detroit, has found in practice that only 8 cubic feet of their gas are required to equal the work of 1 kilowatt hour of electricity for japanning work.

"Unit Costs in Distribution Work" was dealt with by Mr. A. A. Treadway, of the Detroit City Gas Company—"the city of the Ford Company, with its highly advertised $5 per day men." The subject was treated under several headings; the first being the automobile delivery bonus system. After experimenting with

numerous automobiles with varying success, the Company decided on a particular make, and devised a bonus scheme of paying drivers, to promote careful driving and to secure the care of cars. In the operating expenses, which were carefully noted, was included everything except insurance and depreciation; and the cost of operating the automobiles is less now than previously. A figure of 6 c. per mile was fixed as the basis on which to pay bonuses. One-half of all operating expenses under 6 c. per mile in each month was credited to the driver; and all over this was charged to him. If at the end of the year the sum of the debits was in excess of the total of the credits for a driver, he did not get anything, nor was he penalized. He started again with renewed determination to make something the next year. Motor-cycles were dealt with by selling them to the inspectors, who were allowed a certain covering sum monthly, *plus* oil and gas.

For the handling of complaints, the old blow-out waggons, with compressed air tanks, have been superseded by light automobiles, with an air-pump connected to the motor, and tank with necessary gauges. There are also several motor-cycle men to look after special complaints. By these means a reduction of 28 per cent. has been effected in the unit cost of complaints handled; and there has been a better and quicker service, with higher earnings for the men.

For the sale and installation of gas-ranges, a scheme was devised by means of which both the selling and installing could be accomplished by the same men in the same automobile. The cars, of course, were specially arranged, and to each were assigned a fitter and a salesman. One model of range was specialized, no other being kept in stock. During the morning, the greatest effort was applied to selling; while in the afternoon the time was devoted usually to connecting ranges sold from the office. Remuneration to the salesman and fitter was so arranged as to liberally encourage zeal. The results of the plan were: The sales increased greatly; the time between taking the order and connecting was decreased to from fifteen minutes as a minimum to less than a day always; the unit cost of selling and delivery as well as installation was reduced; and the fitters were paid more—in some cases as much as 50 per cent. Something of the same scheme was tried in connection with tank water-heaters; and the same advantages accrued to the Company and to the men as in the gas-range campaign—except that the bonus payment to fitters did not average so much. It was, however, found that, owing to the longer time necessary to instal, and to difficulties cropping-up, the plan did not work so smoothly as in the other case; and this year the selling and installing have been entirely separated. This was done on the theory that too much time was needed to supervise and take the men around, and too little time was devoted to selling. An attempt was made to tackle the sale and installation of automatic gas water-heaters; but the effort at standardizing operations was less successful, and this year it was decided to discontinue the bonus system on this particular line of work, because of the difficulties encountered.

One other paper was read in this section—by Mr. Charles Wilde, on "Oxy-Acetylene Welding in Distribution Work;" some of the purposes to which the process may be applied in various branches of distribution work being enumerated and briefly discussed. It was remarked that oxy-acetylene welding in distribution work is very rapidly taking its place as a means by which many things may be accomplished which in the past have been considered almost impossible of realization; and of these the absolutely gas-tight welded main has been the greatest accomplishment. The first welded gas-main laid in the United States was during the summer months of 1911. Since then many miles have been put in. As oxy-acetylene welding became better understood, the gas engineer was quick to perceive a much wider field for its use than was first thought possible; and to-day it is employed in service, shop, and repair work with equally as great success as it has been in new main work. Quoting figures of the cost of a light and heavy (not unnecessarily heavy) welded joint, Mr. Wilde said that when the small differences of cost per foot of main laid are considered, it is at once evident that no one should, in an effort to economize, lay a gas-main with a joint or joints so light that there might be danger of a break from contraction. It would be far better and cheaper in the end to lay a main with all the joints made with a little too much metal than to have a few made with insufficient metal.

The cost of welded joints is discussed from all points of view. First is given the actual cost covering the exact time required to make the joint; secondly, for the average total time of the operator and helper for welding and adjusting the pipe; and, thirdly, for the total time of the operator and helper, *plus* the necessary extra assistance for lining-up the pipe ahead of the welding. Ditch, stationary, and turning joints are considered separately. The turning joint, as being the most economical, is taken first. The average cost per joint for an 8-inch turning welded joint, considering only the actual time necessary to make it, is put at $1·10, or a cost per foot of pipe laid [20-feet lengths] of 5·5 c. Including the full time of the helper and welder occupied in other work in connection with the welding, brings the cost of the joint to $1·28, or 6·4 c. per foot of main; while still further adding the cost of placing the pipe in position for the welder and helper, makes the total cost of the joint $1·47, or 7·3 c. per foot of main laid. These costs were calculated from 327 joints made by three welders working ahead of the ditch. Considering the ditch and stationary joints, it would, says the author, be found, if the maximum cost of these were taken, that in some instances they would be as high as three times that of the turning joint, depending upon the condition under which it is found necessary for the operator to work.

Analyzing actual figures on an 8-inch main, it is seen that the maximum cost of a joint made when using 20-feet lengths of pipe is 35 c. less than the joint of a 40-feet length under the same conditions; but per foot of main laid, the difference in favour of the long lengths is 2·8 c. These figures, however, do not take into account the possible extra cost due to cartage, which would probably decrease the difference per foot in favour of the 40-feet lengths to about 2·3 c.

The costs of a number of other operations, with details of the work, are given in the paper, which, in pamphlet form extends to sixty pages, and embraces thirty photographs and sketches, and an American bibliography of the subject dealt with.

In the course of subsequent discussion, Mr. E. C. Jones remarked that one danger in the application of this system was that persons were liable to get careless as they became familiar with the operation. If properly made, the joints should be stronger than the pipe; but an operator was sometimes surprised to see the joint break apart without difficulty. When too much acetylene was used in the flame, the steel was converted into cast iron. Another precaution was not to make joints of such a character that they could not be repaired under pressure.

SOUTH-WEST ASSOCIATION OF GAS ENGINEERS.

The Ninth Annual Meeting of the Association was held at the Ashton Hotel, Taunton, on Thursday, the 16th inst.—Mr. H. Alley, of Wells (the retiring President), in the chair. About thirty members and visitors were present.

The President opened the meeting with a few introductory remarks, passing in review the various difficulties now being experienced. Sympathetic references were also made to the great loss sustained by the gas profession through the death of the late Sir Corbet Woodall.

Mr. N. H. Humphrys (Salisbury), Mr. W. Walton (Bradford-on-Avon), and Mr. F. K. Skinner (Martock) were admitted to membership; and the following officers were elected for the ensuing year:

President.—Mr. H. B. Chamberlain (Trowbridge).
Vice-President.—Mr. D. E. Garlick (Glastonbury).
Hon. Auditor.—Mr. F. W. Delafield (Shepton Mallet).
Hon. Secretary.—Mr. A. J. S. White (Chard).

After the business meeting, the members took lunch together; and on re-assembling, the following papers (along with one other) were read and discussed.

TAR: ITS FORMATION AND DEHYDRATION.

By J. Harger Pye, of Clevedon.

In the good old days, when one hydraulic main served for two or more benches of retorts, and the tar therefrom was removed from the top of a small (probably 1-inch) wrought-iron pipe, there were no tar troubles.

About sixteen years ago, at our little works, we erected regenerative settings, with separate hydraulics to each bench, fitted at the bottom with 3-inch diameter outlets for tar, which overflowed at the level of the liquor in the mains. For some unaccountable reason, the tar objected to run uphill to the desired overflow level, and perversely preferred to remain in the main until it was heated to the consistency of pitch. The then universal panacea for all tar troubles, a tar-column, was erected, with a 4-inch diameter tar-main, and 3-inch branches to each hydraulic, connected with tee-pieces to the existing tar-outlets at the bottom of the mains. This was about ten years ago. Very little improvement was effected by the change; the 3 and 4 inch mains being too small to allow the tar to flow down while the liquor was passing up to take its place in the main. The tar became so hard that it often took two hours to empty the column on a cold morning.

Three years ago, we erected four new benches of retorts, and put up another large column in the retort-house. The bottom of each hydraulic was sloped from each end towards the centre, where a 6-inch tar-valve was fixed and connected into a 6-inch tar-main immediately below it, without any turns or twists in it. Cort's anti-dips were fitted; and no expense was spared in order to secure freedom from the previous trouble. It is true we have never had any trouble in the hydraulics or tar-pipes; but we soon had the 6-inch gas-outlets and the 16-inch collecting main full of pitch, and had to keep poking these through. It was evident that, by using anti-dips, and thereby eliminating the friction in the hydraulic mains, the tar was carried further and deposited in the mains past the hydraulic mains.

It then occurred to us that perhaps prevention was better than cure, so we tried to prevent the formation of thick tar. We had noticed a marked increase in tar trouble with the adoption of scoop charging; and I was convinced that the allocation of the charge of coal in the retort was partly the cause. The scoop charge left an almost annular space between the heated sides of the retort and the hot coal or coke, through which space the gas had to pass, and in which it was reduced to the lower hydrocarbons and free carbon. The tar was tested, and found to contain a large quantity of free carbon, while the percentage of water was sometimes as high as 25. Reverting to shovel charging only slightly improved matters; but in the new section we still had

some great difficulty. The scoop-charged settings were unequally heated, the backs being hotter than the fronts; and it was fairly evident that the gas was being broken-up in the hot part of the retort.

Somersetshire coal requires so much heating for perfect carbonization, that it was only possible to use small six-hour charges of about 3½ cwt.; and with 22-inch by 16-inch retorts, this small charge leaves a large space for the gas. The velocity of the gas in this space must have been very low indeed; and the time during which it was in contact with the hot walls of the retorts must have been sufficient to cause considerable breaking-up of the hydrocarbons. We then decided to try filling the retorts with coal, and leaving the charge in until it was burnt off. We tried 6 cwt. in twelve hours, and soon found we had made beautifully thin tar. But the stokers could not stand in front of the fires long enough to draw so much coke out.

We are now using eight-hour charges of 4½ to 5 cwt., and have not had a stopped pipe since we commenced doing so. The tar is thin, and the water-content is not much above 5 per cent. Of course, care has also been taken to maintain regular heating of the retorts, and in resetting more heat is given to the front, so as to ensure uniform heating throughout. Not only has there been no trouble from stopped pipes, but no stoppages have occurred in the mains and valves on the works since the change was made. The make of gas is better—probably 11,000 cubic feet per ton from Somersetshire through coal; but the quantity of coke sold has fallen from 10 to 9 cwt. per ton of coal.

The adoption of the "C" process, and the prohibition of the sale of crude tar to any but distillers, necessitated the erection of a dehydration plant; and we decided to put up a Wilton apparatus, capable of dealing with about 70 gallons of crude tar per hour, or 1600 gallons per day. The cost, with its shed, pumps, a 2000 gallon storage tank, and foundations, was £300. As you know, this plant is very simple. It can, and will, be considerably improved in detail; but it is, on the whole, very efficient and easy to work.

The quantity of light oils obtained varies with the quality of tar (whether treated in the "C" process or not) from 25 to 37 gallons per ton, and averages at least 30 gallons per ton of crude tar. After paying carriage, we get 4½d. per gallon for the oils. There would be about 10 gallons of water and 160 gallons of dehydrated tar per ton of crude tar. Dehydrated tar locally sells at 38s. to 40s. per ton, and on rail at about 30s. Taking 30s. as a basis, we therefore get for oils and tar 35s. 4d. per ton of crude tar.

The cost of dehydration, exclusive of repairs and maintenance, varies from 8s. per ton when working intermittently in the day time, to about 4s. 6d. per ton day and night shifts—or (say) an average of 6s. 4d. per ton. This leaves 29s. per ton, compared with 16s. for crude tar, which is the present price offered by the distillers. If we could succeed in disposing of all the dehydrated tar we can make, the plant would pay for itself in two years. Unfortunately, this is not possible at present. Tar dehydrated at 230° C., as recommended by the Ministry of Munitions, is practically solid, and cannot be handled in casks. Our local Surveyor loads this in his road-tank, and prefers the thick tar; but when it has to be loaded in casks, it is necessary to thin it with creosote. We have found 1 gallon of creosote to 40 gallons of tar when working at 200° C., and about 2 gallons of creosote to 40 gallons of tar when working at 230° C., just sufficient for the tar to flow slowly in or out of the casks.

At the present time, the tar distillers appear to have secured the bulk of the orders for dehydrated tar from the stone quarries, &c., at a low figure, and to be recouping themselves at the expense of the gas companies by offering them a lower price for the crude tar which they are thus compelled to sell to them.

As to storage of dehydrated tar, there is no difficulty in storing small quantities, which can be kept fluid by the exhaust steam-pipes from the engines. Casks are now being filled with a 2-inch pipe from an overhead tank of 2000 gallons capacity containing dehydrated tar made a month ago at 230° C., which has been kept quite fluid by the heat from an exhaust steam-pipe.

With reference to the amount of water removed by the process, practically the whole of the water-content is taken out; and the actual quantity measured corresponds very closely with the tests made by the Bristol University, though it is less than the amount claimed by the distillers.

TAR DEHYDRATION FOR SMALL GAS-WORKS.

By A. R. Wyatt, of Seaton.

The dehydration of tar by the continuous process is, I believe, comparatively new as far as small gas-works are concerned; but it presents possibilities which are worthy of consideration at the present time. I will endeavour, as far as I am able, to acquaint you with the mode of erection and working of small plants, in order to comply with the requirements of the Alkali Acts, and also of the Ministry of Munitions. To those of you who have not already registered under the Alkali Acts, and anticipate putting down a plant, I may say it will be necessary for you to pay a fee of £3 annually; and your plant must be passed by an official of the Local Government Board. In addition, the Ministry of Munitions will probably inspect the plant, in order to ascertain that it is worked up to the desired temperature, and that there is no loss of products.

I notice in the Technical Press that several home-made plants have been constructed, in various parts of the country, from the contents of the scrap-heap and a visit to the local marine store dealer. I am sure you will not derive much satisfaction, and less profit, from these make-shift plants. It is better to map out your requirements, and, if you are depleted in staff and material, to place the work with a competent firm—utilizing, of course, any suitable stuff.

For the successful dehydration of tar, steam is essential. It is a great difficulty in the winter to distil without its aid; and the high temperature now required produces plastic pitch, which solidifies in the pipes immediately it ceases to flow. The situation of a tar plant should be well drained; and an abundance of water for cooling and steam for preheating is necessary. The higher the temperature you distil at, the less money you will get for your light oils, owing to the fact that several fractions come over together. The light-oil vapours should be condensed in two sections, as it will be found that naphthalene, if unduly cooled, will solidify and block up the pipes; whereas if the distillate is warm, a considerable portion of the crude benzol will evaporate.

This is a sketch of a plant capable of dehydrating 10 barrels of tar per working day. The apparatus, which should be under cover, gets its tar by gravitation from an overhead tank. The tar is led from this tank by means of a steam-jacketed tube, serving as a preheater, before it reaches the still proper, which consists of a small vertical internally fired boiler, 4 ft. 6 in. by 3 ft. in diameter, fitted with thermometer, safety-valve, and hand-holes to facilitate cleaning-out the boiler. The preheated tar, at a temperature of about 200° Fahr., is admitted to the bottom of the boiler; and after reaching a temperature of about 400° Fahr., it passes away at the top into an expansion chamber, consisting of a closed iron vessel 2 ft. by 1 ft. 6 in. in diameter, whence it parts with the vapours volatile at this temperature. The dehydrated tar passes away through a jacketed pipe into a tank capable of holding one or more days' working.

The vapours are taken away from the top of the chamber, and are condensed in two sections, by water-jacketed tubes. The arrangement of the pipes is that the condensing water is first used for the light benzol fraction; from there to the heavier fraction, containing naphthalene; and finally for cooling the tar before it enters the storage tank. The light-oil fractions are led into a separator; and then they should be stored in steel drums. It will be found necessary to add (say) 10 per cent. of creosote, in order to render the tar sufficiently fluid for road purposes. If pitch is desired, old barrels with the heads knocked in may be utilized for the purpose. I suggest a steam-coil in the dehydrated tar tank, in order to deal with this difficult material when cooled.

A small purifier is required, filled with lime, and fitted with a seal to the vapour pipes. The object of the lime is to prevent firing, which may occur when oxide is used. The products that depend upon the temperature of distillation will vary with the class of tar; that from country gas-works being preferable to tar obtained from larger works where modern conditions of carbonization exist.

The light oils will be 10 per cent. upwards, and worth from 4½d. to 6½d. per gallon; and they must be sold to a distiller. The tar is worth exactly what you are able to obtain for it.

It is interesting to note the effect of temperature on the distillate, the specific gravity of which covers a wide range from oils lighter than water to those of a much higher degree. All pipes should be lagged with non-conducting material, and the condensing effect obtained from water—this being under greater control. Every pipe should be jacketed and connected in such a manner that steam or water may be admitted, as required.

Ten casks of tar may be considered as being a good day's work with a consumption of 2 cwt. of broken coke and 1000 gallons of water.

In my opinion, very little is known in reference to tar dehydration. I regard any gas-works as incomplete without a tar-treating apparatus, not only from the shareholders' point of view, but from a national standpoint.

COKE-OVEN MANAGERS' ASSOCIATION.

Meeting of the Midland Section.

The first meeting of the new session of the Midland Section of the Coke-Oven Managers' Association was held last Saturday, in the Hall of Applied Science of the Sheffield University. Mr. George Chrisp, who has been re-elected Chairman, presided.

The Chairman, having expressed his thanks for re-election, remarked that the paper to be read would prove of very great value, and should create fruitful discussion. Many of those present would have followed recently matters in the Technical Press, and noticed the tendency on the part of the gas engineers to take up the question of benzol recovery. No doubt some coke-oven men had been a little amused to read of what—judged by the recent discussion on a certain paper read before the Institution of Gas Engineers—was the manner in which some of the leading gas experts were groping in the dark and grappling with problems which the coke-oven industry had faced years ago. He thought the coke-oven industry could safely claim to be the leading benzol people; and the gas engineers would do very well to avail themselves of the coking men's experience a little more, and copy their plant and methods. Mr. Wilson's paper would be hailed with

some amount of glee in certain circles, and would be of undoubted value to the gas people as well as to the coking managers.

Mr. J. A. WILSON then read his paper on:

SOME POINTS IN CONNECTION WITH BENZOL RECOVERY.

The first point to be considered in the recovery of benzol is, of course, the stripping of the gas, and the best means by which this can be accomplished. At Staveley, we use the ordinary tower-scrubbers, filled with boards; the final scrubbing, however, taking place in rotary scrubbers. The distribution of the oil on the tower-scrubbers is effected by means of ¾-inch pipes radiating from a 3-inch circular cast-iron main. These pipes, each of which is fitted with a separate cock, are connected by cross-pieces to short lengths of piping running through the top of the scrubbers. These discharge the oil on to small discs fixed a short distance below the outlets of the pipes; the discs causing the necessary spraying action required for thorough distribution of the oil over the surface of the scrubber-boards. The method employed for distributing the oil is thus of the simplest description; and for my part, I cannot see that any more elaborate device is required. The pipes are readily freed from any obstructions which may form in them by rodding-out through the cross-pieces; and so long as there are sufficient pipes to spread the oil evenly, the only other precaution required is that enough oil shall be pumped over the scrubbers to cause a forcible impinging on the discs, with a consequent good spraying effect.

This point brings us to a consideration of the best kind of pump to employ for circulation purposes. I know of none better than the centrifugal type. In saying this, I am quite aware that there are many excellent types of ram-pumps employed on benzol plants; but a good centrifugal pump is certainly one of the best for dealing with large quantities of oil. The only parts, worth mentioning, which require renewing at intervals are the sleeves and spindles. Most of our centrifugal pumps work with a submerged feed; and these require practically no attention whatever. In the case of the two fresh-oil pumps, which have a suction head of 13 feet, we have found all that is necessary to ensure perfectly smooth running is a sufficient length of gland to allow at least three rounds of ¾-inch packing being held, and due renewals of spindles and sleeves when badly worn.

A valuable aid to the working of the scrubbing plant is a good meter for measuring the oil to the fresh-oil scrubber. As much oil as possible should be circulated over the other scrubbers; but on the proper adjustment of the supply of oil to the fresh-oil scrubber much of the successful working of the recovery plant depends. Though I am unable to give any exact figures bearing out my statement, I consider our experiences with metering the oil at Staveley prove it to be worth such trouble and expense as it involves. No doubt, these meters will be improved as time goes on. At present the chief trouble lies in the corrosion of the working parts, and the blocking-up of the sieve placed before the meter by particles of solid matter in the oil. Of course, other methods are available for checking, in some fashion, the quantity of oil delivered; but none is so direct as metering.

The oil delivery from the last scrubber—the first to receive the gas—should be so arranged that any blockage which may occur (not a frequent, but still a possible, occurrence) will at once be noticed by the scrubber-man on his rounds. This precaution is indirectly observed at Staveley by a small seal-pipe being led from the main, before the gas-inlet to the last scrubber, to a general low-level seal-pot, with which all the drains on the pressure side of the exhauster are connected. The pipe has an open end, and serves the double purpose of detecting any liquor brought over with the gas from the fresh water ammonia scrubber, and of revealing any obstruction in the oil outlet of the benzol scrubber, as in that case the oil would rise in the well of the scrubber until it overflowed into the gas-inlet main, and so would find its way into the seal-pot just mentioned.

It is also a very desirable plan, and one that we have adopted for years, to have all liquor, tar, and oil pipes, with all outlets from steam-traps, &c., fully exposed, so that leakages when they occur may be speedily detected. The efficiency of a benzol scrubbing plant depends on several factors, chief among which are the temperature of the gas, the quality and amount circulated of the wash oil, the extent to which the still debenzolizes the oil, the area of the scrubbers in relation to the quantity of gas to be dealt with, and last, but not least, careful chemical supervision. The last-named should include daily testing of the gas before and after the scrubbers, and regular sampling of the oil at various points in the circulating system. I will take the question of laboratory control first, as a clear appreciation of the extent to which the other factors severally influence production depends to a very considerable degree on the work of the chemist. Unfortunately, the methods of testing we have at our disposal are not all that could be desired.

In 1914, shortly before war broke out, we carried through an efficiency trial on our benzol plant, the general results of which were highly satisfactory; but we had some heartbreaking experiences in connection with the attempt to determine the benzol contents of the gas before and after the scrubbers, which, of course, it was necessary should be done before we could arrive at the true efficiency. Altogether, as a result of our experiences during the trial, we arrived at the conclusion that a good reliable test for estimating small amounts of benzol in gas has yet to be found.

Apart from the testir o the gas, a further means of controlling the working of the crude-benzol plant from the laboratory lies in the testing of the saturated and spent oils for their contents of benzol. The points at which the samples for this purpose should be taken depend, to some extent, on the lay-out of the plant. At Staveley, the initial heating of the benzolized oil is carried out in a series of Woulffe's coolers; the outgoing hot spent oil imparting its heat to the incoming cold oil, on the counterflow principle. Samples are taken daily before and after these heat-exchangers, in order to reveal whether there is any leakage of the cold oil into the hot oil space. Such leakages, if very bad, are sometimes detected by the stillman; but more often they are first revealed by laboratory tests. It is then a simple matter for the stillman to find, by manipulation of the cocks on each section, in what part of the heat-exchangers the leakage is present. We have had a great deal of this sort of trouble, particularly in the summer time, owing to the strongly corrosive properties the wash oil develops in circulation; and the laboratory tests have proved a valuable aid to the early discovery and rectification of any short-circuiting of the benzolized oil.

Samples of the debenzolized oil, as it leaves the still, are also taken every two hours by the stillman, being mixed together and tested each morning, along with a sample taken at the pump of the benzolized oil. Samples are also occasionally taken to ascertain the work done by each scrubber. All these various samples are subjected to the same test. That is, 200 c.c. are placed in a 500 c.c. flask, fitted with a pear-shaped four-bulb Young still-head, which is attached to an ordinary condenser. The flask is protected by an outer casing of thin sheet iron, the upper part of which is hinged in two halves, to allow of ready removal of the flask. The bulb of the thermometer is fixed opposite the side tube of the still-head. The distillation is stopped when the thermometer registers 165° C., the condenser allowed to drain, and the amounts of water and oil read off on the 25 c.c. graduated measure used as a receiver. The test is not an exact one, but sufficiently accurate for purposes of comparison, so long as there is only a small amount of water in the oil. The quantity of water governs the temperature at which the bulk of the oil distils. Up to 2 per cent. of water, this is 100° to 105° C.; from 2 to 4 per cent. of water, 107° C.; from 4 to 5 per cent. of water, 110° C. When the water is off, the temperature drops about 3°, and then rushes up to 165° C. The oil which distils over to 165° C. is by no means all benzol, as is shown by the following tests, which were made with an ordinary retort:

	A.	B.
Spec. Grav. at 60° Fahr.	·950	·986
Drop	90° C.	98° C.
	18 p. ct. at 100° C.	2 p. ct. at 100° C.
	38 ,, ,, 120° C.	9 ,, ,, 120° C.
	48 ,, ,, 140° C.	19 ,, ,, 140° C.
	55 ,, ,, 160° C.	26 ,, ,, 160° C.
	62 ,, ,, 190° C.	42 ,, ,, 190° C.
	68 ,, ,, 200° C.	49 ,, ,, 200° C.
	Residue salty.	Residue salty.

A.—4½ weeks' distillates from the benzolized oil test.
B.—4½ weeks' distillates from the debenzolized oil test.

Leaving the question of laboratory control, we come to what I mentioned earlier as one of the main factors in successful benzol recovery—the temperature of the gas. At Staveley, we have a fairly extensive acquaintance with the effect of temperature on the absorption of benzol, owing to the unfortunate fact that the supply of cooling water is very deficient in summer and autumn. The figures given below of gallons of rectified benzol per ton of dry slack will speak for themselves:

Jan.	2·80	May	2·83	Sept.	2·40
Feb.	3·03	June	2·73	Oct.	2·49
March	2·95	July	2·56	Nov.	2·82
April.	2·96	Aug.	2·41	Dec.	2·85

The quality of the wash oil I do not consider of equal importance, though I do not mean that one should take anything the tar distiller likes to send. The oil we use, when first put into circulation, tests as follows:

Specific gravity at 60° Fahr.	1·041
Drop	211° C.
	92 per cent. at 314° C.
Tar acids	6·5 per cent.

Before rejection it shows:

Specific gravity	1·114
Drop	240° C.
	79 per cent. at 315° C.
	Residue, medium pitch.

Some of the members will doubtless consider the latter figure very bad indeed; but it largely depends on the temperature to which the oil is heated before entering the still. With an inlet temperature of 140° C., and outlet 132° C., there is ample margin allowable for thickening the oil before it need be rejected. The main point is to keep water out; and, at the temperature just quoted, this can easily be done, even with creosote oil of 1·100 specific gravity. Of course, oil of this description could not be worked at the temperatures prevailing on very many plants in this country, where a common figure for the inlet oil is 100° to 110° C., with the outlet from 98° to 105° C. Any drop in the temperatures on these plants must lead at once to water trouble—indeed, it is difficult to see how trouble can be avoided without such drop. On the other hand, I must grant that heating the oil to 110° C. rather than to 140° C. is less likely to cause decomposition products to form, with the consequent thickening-up and general deterioration of the oil. The whole question of the bes

working temperature for the crude benzol still is one that will repay close investigation by the Association.

The extent to which the still debenzolizes the oil depends on the correctness of the design, the temperature and quality of the oil (especially its comparative freedom from water), and the speed of passage of the oil through the compartments of the still. Correctness of design involves, among other details, a proper ratio of the oil compartments to the fractionating space above; a good dephlegmator, the temperature of which can be varied at will; the proper spacing, securing, and sufficient sealing of the agitating hoods; and the provision of good large overflows for the oil. All these are important points, though practice with regard to them has, I believe, largely crystallized by now. The chief points of departure between makers will probably be found in the size of still considered necessary for a given output, rather than in any vital difference of design.

The area of the scrubbers should be such that ample time-contact is allowed between the gas and oil, more particularly so as the process of benzol absorption by creosote oil is a purely mechanical one. A good allowance for the space to be occupied by the scrubbing boards is 16 cubic feet per ton of coal carbonized per day. The amount of oil circulated should be such that a saturation of not more than 3 to 4·5 per cent. is shown by the distillation test already described; the water-contents of the oil being approximately 1 per cent.

The type of pre-heater to be adopted depends mainly on the amount of corrosion likely to occur. Where this is expected to be negligible, a cylindrical steel vessel, containing a wrought-iron steam-coil, will suffice; but where corrosion is to be reckoned with, "all cast iron" should be the rule. A good construction is a rectangular body, built up of a few strongly flanged sections, with cast-iron U-pipes for the steam; these to be free at one end and jointed to the outside of the shell at the other—the pipes being connected to each other by short U-bends, and fixed horizontally, so that the oil will have an impinging action on them in its upward flow through the pre-heater. Gilled steam-pipes should be avoided in the construction of pre-heaters, as they afford ready lodgment for solid matter deposited from the oil, which soon interferes greatly with their efficiency. The corrosion occurring on some benzol plants appears to be due chiefly to ammonia in various forms of combination—with us mainly as sulphide and chloride; the water in the wash-oil containing in our case as much as 5·5 per cent. of ammonia. An interesting, but ominous, occurrence is the undoubted occasional conversion of some of this ammonia into oxide of nitrogen, revealed by both smell and appearance, at the water and benzol outlets of the separator. The distillation of the crude benzol, before washing, does not call for much comment. Our practice is to work two fractions, the first (light oil) embracing all that comes over up to direct steam being required. The heavy oil which follows is collected until naphthalene makes its appearance at the outlet of the condenser. The residue is then run out into the usual cooling-pans.

Some time ago, we took up the manufacture of pure benzol. A still designed for this purpose was put on order; but in the meantime, as our aniline plant was about ready for starting-up, and consequently would be requiring supplies of pure benzol, we made an attempt to produce it with the plant already installed. The distillation of the washed product, pending the erection of the new still, was carried out in one of the old plate column stills, which had only been designed for the production of ordinary 90's. It was, however, thought possible that, by working at a very slow rate, and with severe dephlegmation, a fairly pure benzol might be obtained. At the outset, it was found that the column would only pass back, without choking, a strictly limited amount of benzol; and even with taking several days over the distillation of 3800 gallons, it proved impossible to obtain anything like a pure article.

The "pure" still, which has now been at work for some time, has the bell type of column, with the usual dephlegmator, and an analyzer of the Coupier pattern. We have lately made a series of tests to determine the work done by this particular form of analyzer. The results are given below; and members will form their own conclusions from them. In addition to the water it takes—which perhaps with many would be a small matter—the analyzer has the drawback of causing a lot more steam to be required for distillation:

Distillates.	Three Charges with Analyzer. As Charged. Drop, 79·6° C. Dry point, 99·5. Gallons.		Three Charges without* Analyzer. As Charged. Drop, 78·7° C. Dry point, 101°. Gallons.
Total forerunnings	960	..	1106
Pure benzol	9101	..	8718
To re-work	516	..	746
90's toluol	156	..	195
Per cent. pure benzol in total distillates	84·75	..	81·10

* The analyzer could not be bye-passed; but the term "without" is justified, as the water was cut off, and the syphons conveying the condensates back to the column were all blanked-off, so that anything condensing in the analyzer was obliged to find its way down the vapour pipe to the condenser.

The dephlegmator, under both sets of conditions, was worked at the same temperature.

Our general experience with perforated plates, as against the sealed hood or bell type of column, is all in favour of the latter. Our intermediate still, which is fitted with the bells, has given us no trouble whatever, so far as the column is concerned, in over four years of constant working; whereas the first one of our two rectification stills, which are fitted with perforated plates, has twice in the same period had to have its column dismantled for cleaning, owing to the holes of the trays and pockets of the overflows being choked with rust. Apart from the trouble of dismantling and re-erecting the column, the clearing of these holes is a very tedious process, involving much time and labour. The dephlegmation, also, with the bells, is much more searching than is the case with the perforated plates.

I would like to emphasize the necessity for more reliable, and at the same time practical, laboratory tests. It is by an exact knowledge of the amount of benzol in the gas before and after stripping that we shall be able to find the actual degree of efficiency of our plants. With such a foundation to work upon, it should not be long before benzol plants showing at least 90 per cent. recovery become the rule, rather than, as I fear is the case at present, the exception.

DISCUSSION.

The CHAIRMAN, in inviting discussion, said they had heard a most practical paper from a very practical man.

Mr. J. T. PRICE (Manvers Main) asked what were the comparative costs of upkeep and efficiency of rotary scrubbers as against tower scrubbers. Mr. Wilson had also introduced the matter of packing in his centrifugal pumps. This was, perhaps, a very small question; but at his (Mr. Price's) plant they had had some difficulty, and he would like to know what amount of packing would be best used. In regard to the two methods tried at Staveley, in the attempt to determine the benzol content of the gas before and after the scrubbers, why did Mr. Wilson, in estimating by volume, run the distillation of the paraffin up to a vapour temperature of 165° C.? Why not either 160° or 170°? There was, of course, a different method of testing on every plant. At his own plant, they ran up to 135° at one time; but he must admit he did not know why they fixed this temperature. At present they ran to 110°, and were thinking of running to 120°. Some coke-oven firms recommended a retort and others flasks. At his own plant, they had found on the same oil a difference of about 12 per cent. He fully agreed with Mr. Wilson in recognizing the need for a laboratory test. In regard to the thick oil he put out, Mr. Wilson ran it up to 130°, whereas Dr. Colman, in his specification, declared that it should not be more than 90 at 300°. In regard to the inward and outward temperature of the oil before entering the still, at 140° and 132° respectively, Mr. Lee, of Grassmoor, had once told them that he was satisfied if he got 125°. Why get the temperatures at 140° and 132° while Mr. Lee could get results really better at so much lower temperature? Mr. Lee had told them that he got *nil* in moisture. What did Mr. Wilson work his crude benzol up to? If he worked it at anything less than 65 per cent., could he give some estimation as to the amount of increase in toluol?

Mr. WILSON, replying to Mr. Price, said he was afraid he could not deal very well with the question as to comparative costs of scrubbers. The rotary scrubbers had given some trouble at the beginning, chiefly in the engines; but with a suitable smooth running engine they now found no trouble. They had originally had some little trouble occasionally through the blocking of the outlet by bristles. They had now a more tortuous way to the tower scrubber; and had adapted a mud box as a catch box, because the rotary scrubber used to get choked up. As to the packing in the glands of the pump, they found cotton packing better than asbestos. With reference to the temperature for the distillation tests on the benzolized and debenzolized oils, he had often asked himself the question "Why 165°?" They were now experimenting to see if it was really necessary to go so high. With regard to the circulating oil, he did not know why he should fix it at the amount he had done, unless it was a case of not wanting to get it too thick. As to the temperature at the inlet and outlet, he had asked that tests should be conducted on this point. At his place, they had always worked at these figures; and they found if they came down lower they got water. In regard to the quantity of crude oil, at his plant they generally worked at about 60 to 65 per cent.; but in the summer time it went down on its own account. During the past summer, they had been getting up to 60 and 65 per cent., and had not been recovering in proportion at the intermediate still. This was due to naphthalene. They were relining one of their ovens, and had found more naphthalene than usual. As to the increase in toluol, the amount of toluol in their total benzol was very small—only about 9½ per cent.

Mr. G. TAYLOR (Silverwood) said the author had mentioned having some trouble with bristles from the scrubber. He (Mr. Taylor) thought the bristles were in the pitch. He wondered if there was any trouble with gases liberating in the case of the retort. Did Mr. Wilson determine the naphthalene separately in the liquid he got, or did he let it go as such? [Mr. WILSON: We let it go as such.] The author had also remarked that troubles were caused by the variations in paraffin. He (Mr. Taylor) thought that if they freed the oil they should get a perfect stripping of the gas sample.

Mr. WILSON said the paraffin was that prepared under the "British Pharmacopœia."

Mr. TAYLOR, continuing, said in regard to the figures Mr. Wilson gave for the accumulated distillate, it appeared to him that he got a rather larger amount than he should do, and he thought his amount of distillate in the first case must have been very excessive. Each plant must find out these temperatures for itself, because

the conditions varied so much in different plants. The amounts of toluol and benzol would keep fairly constant, and if tests were made, it was not a difficult matter to find the centrifugal temperature if they made their temperature work out at 60° to 65°.

Mr. WILSON: The bulk of the oil did come off at about 107°, and this would be the conditions under which the saturated oil was made.

Mr. TAYLOR said he thought Mr. Wilson could have his wash oil thinner, because if they had too thick oil they had the scrubbers being glutted. He noticed Mr. Wilson was very much in favour of the cap still for rectifying. Did he not think that this point was very much a matter of design? They might have a bad cap still and a good plate still.

Mr. WILSON said the tar distillers would probably know more about it than he did. In answer to a further question by Mr. Taylor, he said he had not actually collected oxide of nitrogen as such; but it was undoubtedly there at the outlet.

Mr. J. T. WORTHINGTON (Parkgate) said in regard to the testing of the gas before and after the scrubber, the figures on his plant had been 4 per cent. before and 2·6 per cent. after. They found that the difference of 1·4 was maintained fairly steadily, and he thought this method might be taken as a means of works determining. He had found when he made 65's oil they got about 160. If they made 62's oil, they obtained 70. He thought that the best figure would be a selling basis on a 160 figure and not on 120. The 120 had been imposed on the industry in times when toluol was low priced. The prices had gone up; and he thought 75 at 160 would be a fair figure to give and take, below and above. If they could regulate the feed of the still, they would find whether the oil was being fed to the still properly by the inlet temperature, everything else being normal. At Parkgate, they had had no trouble in getting free from water at 104 output. The quality of the wash-oil was very important. According to the quality of the wash-oil, so they would get their quality of crude oil. At a plant of which he knew, where they used anthracene oil, they obtained 80's benzol. In regard to the separation of the oil for rectification into two fractions, Mr. Wilson took his first fraction much higher than was done at his (Mr. Worthington's) plant. It paid at Parkgate, from the washing standpoint, to change over with slight toluol and wash the heavier toluene. In regard to the investigations which were taking place, he thought the Association ought to apply for a grant for research purposes.

Mr. WILSON said he agreed with Mr. Worthington that 160 would be a better point to take the crude oil to than 120. At Staveley, they did not sell the crude oil, but worked it up to the finer points. If he were working to sell the oil, he would like to sell at anything from 55 to 60. Their test was coming out higher just now; but they did not find it was all benzol. There was a great deal of naphthalene in the oil. As to meters, with him the chief trouble had been the corrosion of the working parts, which were of brass and were affected by ammonia salts. If it were possible to make these parts of cast iron, it would be better from this point of view.

Mr. WORTHINGTON, supplementing his former comments, remarked upon Mr. Wilson's obvious fondness for rotary centrifugal pumps, and said his own experience had been much against them.

Mr. WILSON said it might be, of course, a question of the design of the pump.

Mr. T. C. BISHOP (Blackwood) said a question had been asked as to a good packing. This could be obtained from Messrs. Angus. The principal thing needed for testing was a standard test before and after the scrubbers.

Mr. W. GREEN (Manvers Main) said, as to the water trouble, it appeared to him to be purely a thermal matter. The question was, how did the water exist? Was it pre-water or water of combination with phenol bodies? This raised the question of the phenols in the wash-oil. He noticed that a gas engineer, Mr. Bond, had said that gas engineers did not know phenols interfered at all with the recovery plant; but some of the coke-oven men might have something to say on their experiences, which were so much superior in this matter to that of the gas people. There seemed to be an increase in the phenol content of the oil; and this raised the question as to whether these phenols were picked up in the scrubbers. It appeared to him that this was the case. He would like to ask Mr. Wilson if it would pay to recover the phenols from his crude benzol and also the recovery of bases in this crude benzol. Then came the question of what influence the phenols had on the naphthalene. Naphthalene was said to be a deterrent to wash-oil. It appeared from his own experience that the phenols had a solvent action on the naphthalene, and had the power to carry it in solution. Such points as these were important to the industry, and were very suitable subjects for investigation; and he thought the least the Association could do would be to have a Special Committee to investigate such problems. Then they came to Mr. Wilson's tests on benzol and rich and crude oil, and he (Mr. Green) found, as Mr. Wilson did, that as the water content increased they got more distillate over.

Mr. WILSON said with regard to the phenols in the wash-oil, he had not gone into the matter. Speaking generally as to the quality of the wash-oil, his plant's experience had been that if they worked on a low temperature they worked on a very poor oil. They got deposits in the scrubbers and elsewhere, and had to clean. As regards recovery of benzol, if they had a low temperature, they got the recovery all right. As to the phenols in the crude benzol and the spent oil, they at Staveley had not taken this up so far. As to the loss of benzol in the return gas, he had quoted no figures, for the simple reason that he did not think they were worth much on the present tests.

Mr. JAMES W. LEE (Grassmoor) said metering was one of the points which had always been very much to the front in gas engineering. He ventured to ask members present that evening if they know by meter how much water they were supplying to their ammonia scrubbers. This was a point which had occurred much in the gas industry. He entirely agreed with Mr. Wilson that every point of difficulty which they could eliminate when they were out for the tracing of toluol they should take full advantage of. The discussions which used to take place ten or fifteen years ago in connection with naphthalene in the gas distribution industry had had the net result of enabling them to find the curious fact that, where all other conditions seemed to be absolutely identical, that which was trouble in one case was not so in another, and that which was a remedy in one case was not in another. All they could do in papers like that by Mr. Wilson, and those by other members, was to hear the general experiences; but they must not think they could necessarily apply another man's temperatures to their own plant. As to the matter of why the temperature of 165° had been chosen, he thought, in view of all the circumstances of the industry, that this was a fairly natural figure to take; and in his own case they had got into the habit of testing crude oil at 167° In regard to washing, Mr. Wilson had put the figure at 3½ per cent. He (Mr. Lee) was in the habit of measuring by weight; and he worked Mr. Wilson's figure out at about 7·8 per cent. by weight. This compared with his own figure of 3 per cent. by weight—a very different percentage. He had often wondered whether some of the high percentages of benzol recovered here might not be due to the high temperature which Mr. Wilson had. Mr. Bishop had mentioned shale oil as against creosote oil, but he (Mr. Lee) had to suggest again that one man's medicine was another's poison. Shale oil had increased his own water content very greatly. He had found it absolutely impossible under any temperature to remove this water content, and he had had to change-over once again to creosote. The question arose, was naphthalene entirely a disadvantage in creosote oil from a washing point of view? It seemed to him that it was a very good medium for removing benzol. The trouble, of course, came in the after-treatment, when they had to bring it out. From a mere scrubbing point of view, he held that naphthalene was a clear advantage.

Mr. WILSON said as to the metering he was glad Mr. Lee agreed with his own views. As to the amount of fresh oil circulated, at his plant they circulated up to 100 or 120 gallons per ton of coal carbonized per day. The loss of creosote was rather high; but he was not satisfied with figures he had got out recently. As to the effect of the temperature on washing expenditure, he knew Mr. Lee worked at a lower temperature than they did at Staveley; but he did not think one could do without a certain amount of acid. On his plant, they first of all washed for 90's for the slender benzol, and then washed again for the standard benzol.

Mr. B. W. HAIGH (Barnsley) said with regard to the percentage of efficiency product recovered from 65 per cent. crude, he would like to hear from some of those who had had recent experience what figure one might expect. He had heard 78 per cent. quoted, and even 82 per cent., though he had been told by others that 72 per cent. was a maximum.

Mr. WILSON: We found 70 to 72 per cent. is about our figure, but under present conditions our oil is not a true 65. With true 65's, we ought to get at least 85 per cent.

Mr. THORPE (Barugh, Barnsley) said Mr. Lee's remark as to consideration of the subject in the past by gas engineers was one of the things they ought to bear in mind. They should remember that, after all, the gas engineers were the pioneers in benzol recovery, even though the coking people were now getting well on their legs. His own experience had been that heavy oil was the best for extracting benzol; but this was not the only thing they must consider. They had to remember the thickening of the oil afterwards, and the action of their heaters, &c.; and he was inclined to agree with Mr. Bishop and mix a heavy oil with the Scotch oil, and in this way get an oil with a gravity of something like 1·06.

Mr. WILSON said, with regard to the relative temperatures of the wash-oil and gases, he agreed that there ought not to be a great deal of difference. As to the wastage and thickening of the oil, they should wash preliminarily in a washer in which they allowed the oil to thicken and reject it entirely, and not trouble about the benzol content of this. He thought that Mr. Lee was right about the naphthalene question.

Mr. J. P. CARR (Waleswood) mentioned that with the direct recovery plant one was not, in the ordinary course of things, troubled by the oil thickening.

The CHAIRMAN, in bringing the discussion to a close, said he would like to state at once that nobody appreciated more than he did the great work which the gas industry had done in these matters, though he had not been aware that the gas engineers were actually the pioneers of benzol recovery. If they were such pioneers, he thought they had hardly got as much experience out of it as they might have done. But, of course, they had been handicapped, and he was sure the coke-oven industry would be glad to give the gas men any help possible. His own experience with regard to shale oil had been like that of Mr. Lee. He had had great trouble with water. In using anthracene oil, too, his undertaking had had a most disastrous experience.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Oil-Washing of Gas.

SIR,—Having, unfortunately, been prevented from attending the Southern District Association meeting, I ask your indulgence for a statement of my Company's record in the matter of washing gas with green oil for the extraction of benzol and toluol.

We have done this since 1913, in which year the first plant of the kind was installed at Beckton. Thus, when the Government call for toluol and benzol extraction was given, we were able to respond immediately, and have had the satisfaction of placing at the disposal of the Government thousands of gallons of the material which they would otherwise have lacked. Notwithstanding considerable differences of opinion, we steadily adhered to this process; and it has since been extended to all suitable stations of the Company.

All the points of successful working with oil mentioned in your report of the meeting, have been settled in the course of our experience, and have been freely communicated to the numerous gas engineers who have visited our works for the purpose of seeing the oil-washing process in operation. I am, therefore, able to assure any who may yet be doubtful as to their taking up the practice of green-oil washing, that it is both effective and without serious drawback.

I would echo Mr. H. O. Carr's war cry, "Don't lag behind in putting up your debenzolizing plants."

I must add the warning that the addition of oil to the treated gas, to compensate not so much for the loss of benzol and toluol as for the solvent naphthas necessarily removed with them, is advisable as a preventative of naphthalene trouble, which otherwise is certain to ensue.

T. GOULDEN, Chief Engineer
of the Gas Light and Coke Company.

Horseferry Road, S.W., Nov. 24, 1916.

Old Gun-Barrel Gas-Service Pipes.

SIR,—With regard to the very interesting letter from Mr. R. B. Prosser, which is quoted on p. 409 of last Tuesday's issue of the "JOURNAL," may I say that, in or about the year 1874, when overhauling the mains and service-pipes in New Street, Birmingham, preparatory to this being newly paved, I came across an old gun-barrel that had apparently been used as part of a service-pipe. I kept it by me for some years, and it figured in several exhibitions, but eventually lost sight of it. I remember noting the difficulty as to jointing, to which Mr. Prosser refers; and I agree with him that not a great many could have been used for the conveyance of gas. But some were apparently so used in the primitive days of gas distribution.

CHAS. HUNT.

17, *Victoria Street, S.W., Nov.* 24, 1915

Oil-Washing of Gas for Benzol Extraction.

SIR,—I have read the "JOURNAL" account of the very valuable and interesting discussion at the Southern District Association meeting on the 16th inst.

From your report, it would appear that I did not make my position clear in the matter; for I am reported to have said that "they must in this particular matter sweep aside the patriotic side." The point I wished to make was that, apart from patriotic reasons, I do not consider the time has come for stripping our gas of all, or nearly all, its illuminating constituents. I had previously stated that there was no question as to the paramount importance of washing for benzol, &c.

With regard to Mr. Livesey's statement, "that when the war commenced there was no idea of washing gas by oil," surely oil-washing was suggested, if not adopted, before tar-washing was employed.

D. H. HELPS.

Reading, Nov. 23, 1916.

Rise and Development of Bye-Product Coking.

SIR,—In your issue dated the 21st inst., a contributor refers to the inception of the direct ammonia recovery process, and, while incidentally observing Brunck's efforts, neglects to give due prominence to those English inventors who, in my judgment, may truly claim to be the originators. In all probability, this is due to an oversight when treating the more practical aspects of this subject, which does not dissect the various claims made therefor.

It may be of interest to recall an article of mine which appeared in the "Iron and Coal Trades Review" for May 15, 1914, in which I laid stress upon the priority of English inventors as concerned many details of the bye-product oven, and the allied recovery plant. In particular, I mentioned the patents of Thomas Rigby, No. 20,716 of 1901, and Frank Scudder, No. 10,313 of 1890, in contrast with both Koppers' and Brunck's later publications. The subject did not permit me to make any detailed and similar reference to those important British patents which vitally affect the validity of certain ovens.

Let us in these times remember the British pioneers, and boldly acknowledge the insuperable difficulties which circumscribed their efforts, thus relegating any commercial advantage to others. Then we can register a determination to prevent in the future national loss suffered in this way.

D. BAGLEY.

92, *Victoria Street, S.W., Nov.* 23, 1916.

Cork Gas-Works Coal Blaze.—An outbreak of fire at the Cork Gas-Works, in a stack of about 100 tons of coal, while it did not threaten the ordinary operations of the works, caused a good deal of trouble. Combustion occurred in various parts of the interior of the stack, which emitted clouds of steam and gas. The assistance of the fire brigade had to be requisitioned; and water was played on the coal for a day and night. This had the effect of preventing the spread of the fire; and the coal was then removed for carbonization.

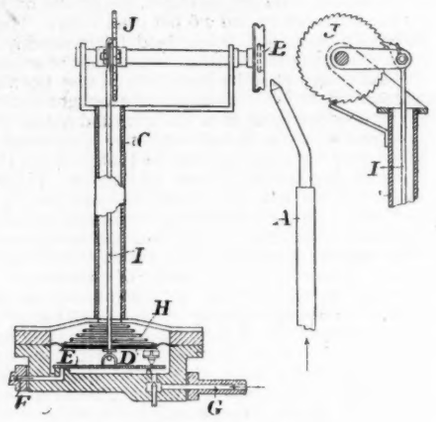
REGISTER OF PATENTS.

Incandescent Lighting Means.—No. 101,080.

SVENSKA AKTIEBOLAGET GASACCUMULATOR, of Stockholm.

No. 8352; June 13, 1916.

The patentee's object is to provide a disc, cylinder, or the like, to be made incandescent by a flame in a burner located in front of it. Under the influence of the flame, the incandescent body is gradually worn on the spot where the flame strikes, so that a hole is formed which would at last burst, and the incandescent body would need to be exchanged for another. But, by putting the incandescent body in motion, the wear can be distributed almost over the whole of its surface. According to the invention, this motion is performed by mechanism actuated by diaphragm apparatus in which the admission and escape of gas are controlled by an automatically working valve.



A Swedish Gas-Burner Igniter.

A vertical section (partly in elevation) and a side view of the apparatus are given.

A is the gas admission pipe of the burner above arranged in front of an incandescent body formed as a disc B. The holder of the incandescent body is mounted in a support C on a shaft which is caused to rotate intermittently by mechanism actuated by the diaphragm D. The automatic valve E controls the conduit F for gas escaping from the diaphragm casing. The gas is admitted at G. When the gas pressure on the diaphragm overcomes the pressure of the spring H, the valve E keeps the gas outlet open until the pressure sinks and finally closes it. From the valve projects (for the purpose of operating the incandescent body) a rod I which at its upper end carries a pawl that engages a ratchet wheel J on the shaft.

Corresponding to the movement of the diaphragm the ratchet wheel is driven step by step and imparts to the holder of the incandescent body and the incandescent body itself a rotary movement, so that the flame of the burner constantly plays on fresh parts of the incandescent body, and the disadvantages before referred to are obviated.

By connecting the admission pipe G with the burner conduit the additional advantage is gained that the operation of the diaphragm is made dependent upon the flame of the burner, so that the apparatus is put in motion when gas is admitted to the conduit for lighting the flame, and is put out of operation when the gas is shut off from the conduit for extinguishing it. In such an arrangement the flame, when lighted, will begin to act upon the incandescent body on the same place as that on which it finished its action on the incandescent body when the flame was extinguished, "whereby a more uniform wear of the incandescent body is effected than when driven by clockwork."

Retort-Furnaces and Coke-Ovens.—No. 101,215.

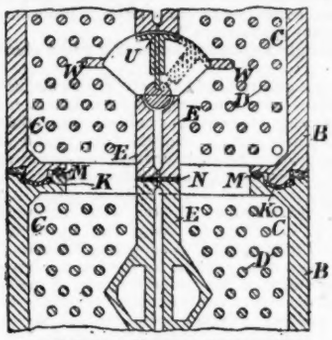
AARTS, J. G., of Dongen, Holland.

No. 11,203; Aug. 8, 1916. Convention date, Aug. 13, 1915.

The specification of this patent, though not yet accepted, is abstracted in the "Official Journal of Patents," being open for inspection under section 91 of the Act.

The abstract states: In vertical coke-ovens or retort-furnaces for carbonizing and reducing, the walls of the ovens or retorts are formed as heat reservoirs. The walls are built of materials of high specific heat and density; so that, in each horizontal plane, the heat capacity of the walls is several times greater than that of the charge. The bricks are formed with a large number of narrow passages, in order that the area of heat-absorbing surface is many times greater than the corresponding wall area of the retort or oven. The resistance to the flow of the heating-gases may be increased by providing transverse baffles in the narrow passages formed in the bricks. In continuously-operating ovens or retorts, the heating is so controlled relatively to the rate of descent of the charge that the temperature of the heating-walls at the lower end is about 1500° C., and at the upper end 500° C.; and in each horizontal plane the temperature-difference between the heating-wall and the charge is about 300° C. The temperature zones may be formed by incorporating in the bricks different proportions of materials of high or low heat conductivity; and the zones may be insulated one from the other by layers of non-conducting material—such as asbestos. The heat-radiating surface of the inner wall of the retort may be increased

by embedding in it a material harder than the charge—for example, crystals of silicon carbide, chrome-iron ore, or quartz.



Aarts' Retort-Furnace Construction.

In the construction shown, the heating-walls between the retorts are built of bricks B formed with a large number of vertical passages C, across which extend transverse rods or bars D. The bricks are jointed by tongues and grooves, and are insulated from one another by asbestos packing K, M, N. Each heating-wall is divided by a partition E; and the proportion of heating-gases supplied at either side of the partition is controlled by a pivoted damper U operating between stop-bars W.

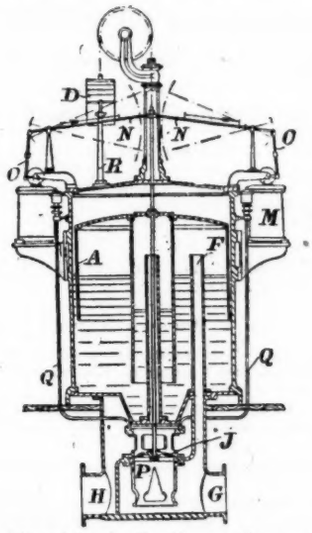
The bricks may be formed of silicon carbide, chromite, or graphite; and refractory clay may be used as mortar. The surfaces of graphite bricks which are in contact with the heating-gases may be protected by a covering of non-oxidizable refractory material.

Regulating Gas-Pumps, &c.—No. 101,486.

SMULDERS AND CO., of Utrecht, Holland.

No. 13,151; Sept. 15, 1916. Convention date, Sept. 15, 1915.

According to this invention in regulators for gas pumps, compressors, &c., the speed-regulation of the motor driving the pump is combined with the regulation of the flow of gas; the two regulations being dependent on one another in such a manner that the flow-regulation comes in aid of the speed-regulation only when the gas output at the time has fallen to a determined adjustable minimum.



Smulders' Regulator for Gas Pumps, Compressors, &c.

As shown, a bell A is suspended in a vessel containing water, and is balanced by a weight D and a cord passing over a pulley. The space below the bell is connected by a pipe F and a neck G to the suction side of the pumps; while the suction side is separated from the delivery side at H in the regulator by a disc J, which is adapted to slide in a cylinder P having upper rectangular apertures and lower triangular apertures. The disc and bell are connected by a rod which acts through levers N, provided with slidably adjustable weights, and rods O (adjustable in length) on the speed regulators M of the gas or steam engines driving the pumps. The upper part of the cylinder P has a slot for pipes Q to discharge into the cylinder an oil that is a solvent of tar, so as to prevent the parts from being choked with dirt.

When the gas pressure falls in the suction main owing to diminished gas output, the bell falls and acts on the speed-regulators to lower the speed of the motors. The weight D, the weights on the levers N, and the length of the rods O are adjusted to bring the flow-regulation through the triangular apertures in aid of the speed-regulation at a determined minimum pressure. When the pressure becomes too great in the suction-main, the bell rises; the speed of the motors is increased; and at a determined pressure gas flows through the rectangular apertures in the cylinder P from the suction-main to the delivery-main—an adjustable part of the weight D being allowed to rest on rods R, so that a high pressure in the suction-main is required to raise the bell sufficiently to open the rectangular apertures.

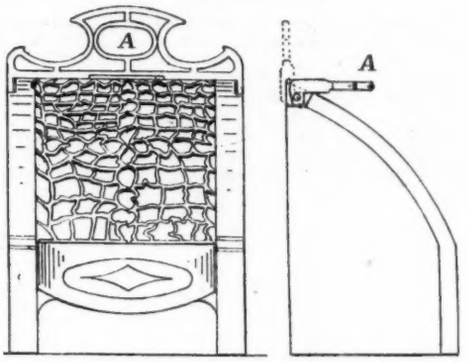
The regulator may, alternatively, be used to maintain a given pressure in the delivery-main; the apertures for the return flow being arranged above the disc. By this means, it is claimed that it is possible to maintain a supply of gas over long distances without requiring gasholders.

Gas-Fires.—No. 101,850.

WILSON, W. A., of Armley, near Leeds.

No. 8886; June 24, 1916.

The inventor's object is to arrange a hob or rest for kettles or the like for use with gas-fires, provided towards the top of the fire, so as to make available the heat from the fire for boiling purposes. The usual form of hob, as the patentee points out, has been one at the base of the fire, and in many cases special kettles must be constructed to present a large surface to the face of the fire. His hob comprises a suitably designed ornament for the top of the fire, and hinged to the casing of the fire so that it may be turned from the vertical to assume a horizontal position over the fire when desired.



Wilson's Hob for Radiant Gas-Fires.

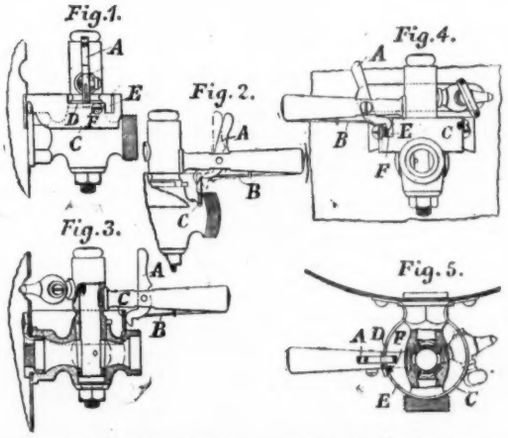
He shows the front of a fire with curved radiants mounted in a detachable casing. The upper edge of the fire is ornamented with a finial or hob A of light open design, so as to present a fairly large surface for carrying utensils over the fire when the hob is placed in the horizontal position. The hob when in the vertical position fits into the back of stove, along the upper edge, but when turned down engages the sides of the casing, which will act as a stop and thus ensure the hob being horizontal.

Gas-Taps.—No. 101,739.

BARRALET, T. E., and the PARKINSON STOVE COMPANY, LIMITED, of Birmingham.

No. 1291: Jan. 27, 1916.

This invention relates to taps for gas geysers or water heaters in which a pilot jet is provided; the object being to prevent the tap being turned on quickly, "thereby avoiding the gas being suddenly ignited with a flare, which is liable to cause the deposit of soot within the inferior of the geyser."



Barralet's (Parkinson's Stove Company) Gas-Tap for Geysers.

Fig. 1 is a side elevation of the tap. Fig. 2 is a sectional elevation, showing how the stop arrests the movement of the tap. Fig. 3 is a vertical section showing the stop trigger or lever moved clear of the stop-frame to allow of the tap being fully opened. Fig. 4 is a front elevation, and fig. 5 is a sectional plan, of the tap.

The handle of the cock carries a pivoted trigger or lever A, preferably pivoted within a longitudinal slot in the handle and having its lower ends normally forced inwards towards the plug by a spring B under the handle. The lower end of the trigger, which constitutes a moveable stop, is bent to form a nose, which, when the tap is closed (fig. 1), engages upon the inside of a circular frame or band C surrounding the tap body at some distance from the latter. The frame is

attached to the geyser casing, and the portion which is under the trigger when the tap is closed is cut away or gapped at D along its upper edge, and at the outer end of the reduced part is a deep gap or gate E of sufficient depth to enable the trigger to be withdrawn through it when brought opposite. The outer edge of the gap (extending to the top of the frame) constitutes a stop-shoulder against which the trigger engages when the tap is being opened, as in fig. 2. This positively arrests the movement and allows the gas to be ignited when only partly turned on. The trigger stop then has to be disengaged by pressing the upper end inwards into the position shown by dotted lines in fig. 2, so that the lower nose end passes outwards through the gap E, when the opening movement of the tap can be completed (see fig. 3).

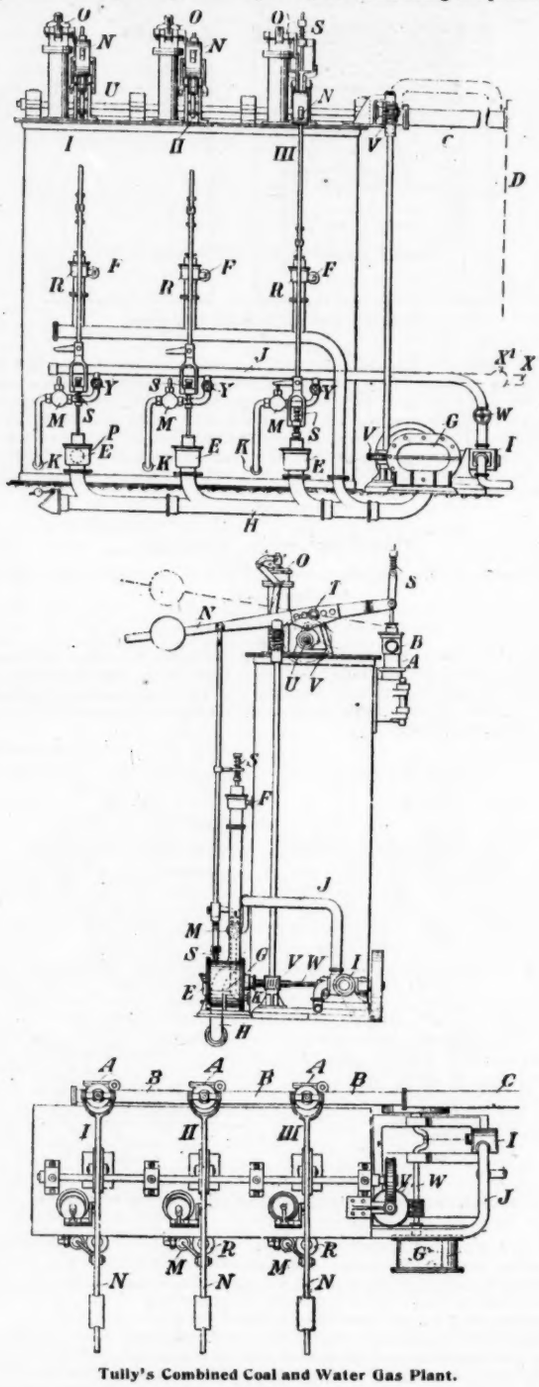
To prevent the tap being rapidly opened by keeping the trigger pressed against the inside of the frame during the initial movement, a stop F projects from the inside face; and normally the spring keeps the nose of the trigger clear of this stop.

Manufacture of Gas.—No. 101,815.

TULLY, C. B., of Victoria Street, Westminster.

No. 1318; Jan. 27, 1916.

This invention relates to plant wherein coal gas and water gas are manufactured separately, with capability of withdrawing the products



Tully's Combined Coal and Water Gas Plant.

from both by a common exhauster and utilizing them in admixture. The principal object aimed at is to supply to the unpurified coal gas an uninterrupted, and substantially uniform (apart from intentional variations), stream of water gas, "which thus does not cause appreciable variation in the effect of the exhausting means upon the withdrawal of the coal gas, and consequently contributes to uniformity in the character of the resultant gas mixture."

Elevations at right angles one to another and a plan of the plant are given.

Three water-gas generators I., II., III. are each adapted to supply gas through a separate valve A to a pipe B for conduction to the foul main C of a bench of retorts for coal-gas manufacture—the water gas entering the main at either end (as suggested by the full and dotted lines) but in each case prior to passage through the purifying section of the plant, of which D represents a condensing tower.

The generators are provided with main air inlets E and supplementary air inlets E, as sometimes adopted when carburetted water gas is to be supplied as described in patent No. 15,194 of 1905. G is a blower connected to the piping H supplying the main and supplementary air inlets. I is a steam-engine for driving the blower; its exhaust pipe J supplying steam to the generator inlet K under the control of valves M. The gas-outlet valve of each generator is connected to a lever N that serves to actuate a corresponding air valve R and the steam-valve; springs S being preferably interposed in the majority of the connections in order to absorb shock and secure the proper closing of the various valves. Each lever, pivoted at F, is provided with a roller adapted to engage a cam. The several cams are mounted upon a shaft U driven through double reduction worm and worm gearing V from the engine-shaft W.

When the weighted left-hand arm of any of the levers N is in its lower position, the corresponding gas-valve A and steam-valve M are open, and the main and supplementary air valves E and R and the snift valve O are closed. The corresponding generator then produces water gas; whereas when the arm of the lever is raised the valves A and M are closed and the valves E, R, and O open—the producer being then blown.

W is a hand-controlled throttle valve on the exhaust pipe J; and X is a pipe with a stop valve whereby steam can be supplied to the pipe J beyond the valve W from a source other than the engine. Y are hand-controlling valves for regulating the steam supply to the individual gas-generators through the valves M.

Provision is made to allow of each gas-generator being put out of action when it is desired to remove clinker from it. Thus each lever N may be locked in position when its left-hand end is raised and the corresponding gas-valve A is closed and the snift valve O open—the rod that opens the air-valves E and R when the arm is raised being put out of operative connection with the arm so that the air-valves close by gravity. Such operations do not close the valve M; but steam is shut off therefrom by closing its corresponding stop-valve Y.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Nov. 22.]

Nos. 16,207—16,582.

CRACKNELL, T.—"Safety-valve for rubber connections for gas stoves." No. 16,488.

ROBERTS, J. H. T.—"Electric-wire gas-lighting appliance." No. 16,348.

SHEARD, J. T.—"Obtaining valuable products from waste hydrocarbonaceous residues." No. 16,556.

SLACK, J. E.—"Pipe-joints." No. 16,262.

No. 16,194.—"Circular tanks." BARNBY, F. M., is joint patentee with THOMAS PIGGOTT AND CO.

APPLICATIONS TO AVOID OR SUSPEND PATENTS.

No. 20,870 of 1904.—"Obtaining bye-products in the dry distillation or gasification of fuel." Grantee: KOPPERS. Applicants: SIMON CARVES, LIMITED.

No. 16,386 of 1905.—"Treatment of gases obtained from the dry distillation or gasification of fuels." Grantee: KOPPERS. Applicants: SIMON CARVES, LIMITED.

Women Gas Workers at Oldham.—At the meeting of the Oldham Gas Committee, Mr. Tim Duxbury (the Engineer) reported that there were now seventeen women employed inside the gas-works as labourers. They were giving entire satisfaction, working from light to dark, about 44 hours per week, for which they received 6d. per hour, *plus* 2s. war bonus, or 24s. altogether. He would probably require more women as the winter progressed; and if they kept up their present amount of work, he saw no reason why their wages should not be increased to 6½d. per hour. The men received 6½d. per hour, and 5s. bonus. At some of the jobs the women were equal to the men, and at others better. He was not alluding to the regular men, but to those he could get hold of to-day. It was also reported that there were now eight women and six discharged soldiers acting as meter inspectors.

Alleged Preferential Charges for Electricity at Hackney.—The Electricity Committee of the Hackney Borough Council have had under consideration the question of a writ which was served by the Gas Light and Coke Company, in respect to an action by the Company against the Council asking for: "(1) A declaration that the defendants are acting in breach of the provisions of the Electric Lighting Act, 1882, in supplying electricity for lighting purposes to persons who take electricity for power purposes also, at a lower rate than they supply the same to persons who take it for lighting purposes only. (2) An injunction to restrain the defendants from making any such differentiation in the rates charged by them for the supply of electricity in breach of the provisions of the said Act. (3) Costs." The Committee have caused an appearance to be entered, and have given instructions for all steps that are necessary to be taken to defend the action on behalf of the Council.

PARLIAMENTARY INTELLIGENCE.

NOTICES GIVEN FOR BILLS (SESSION 1917) RELATING TO GAS AND WATER SUPPLY.

Barrow-in-Furness Water.—Enlargement will be sought by the Barrow-in-Furness Corporation of their powers for taking water from the River Duddon. Authority is required to borrow money for the purposes of the Act, and of the Corporation water undertaking.

Bedwas and Machen Water.—Notice of an Omnibus Bill by the Bedwas and Machen Urban District Council includes provisions with regard to the supply of water by the Council in the parish of Machen Upper.

Blackpool Gas.—Notice is given by the Blackpool Corporation of a Bill for various purposes, among them to extend the boundary of the borough so as to include the urban district of Bispham-with-Norbreck and a portion of the Fylde rural district, and to extend the Corporation's limits for the supply of gas to include the added areas and so much of the township of Carleton as is not comprised within the limits for the supply of gas of the Poulton Urban District Council. It is proposed that the added areas shall form part of the borough for the purposes of the enactments relating to the Fylde Water Board.

Bolton Corporation Water.—An Act is to be asked for by the Bolton Corporation to enable them to obtain an additional water supply, and to carry out the necessary reservoirs, aqueducts, &c. The scheme includes the acquisition of further gathering areas; power to increase charges for water for domestic purposes; and capital and reserve fund provisions.

Bristol Water.—The Bristol Water-Works Company will apply for authority to construct new water-works; to carry out certain sewerage works; to extend the limits of supply of water to include the parish of Nailsea; and to raise additional capital.

Chepstow Water.—Authority will be asked by the Chepstow Water Company to acquire lands and buildings and appropriate streams, &c., for the purposes of their undertaking, to carry out various works, and extend their limits of supply. They wish for power to purchase the undertaking of the Pwll-meric Water Company, Limited; to increase or otherwise alter the rates and charges now authorized; to define the capital and borrowing powers; to grant pensions; and to make various conditions with regard to supplies.

Ebbw Vale Water.—Authority is desired by the Ebbw Vale Urban District Council to increase the existing charges for water for all purposes, and for the hire of meters and fittings; and to vary the provisions of an agreement entered into with the Nantyglo and Blaina Urban District Council. The revival of powers for the compulsory purchase of land required for works authorized by the Ebbw Vale Water Act of 1913 is also suggested.

Gas Light and Coke Company.—Reference has already been made in the "JOURNAL" [*ante*, p. 404] to the notice given by the Gas Light and Coke Company.

Haslemere and District Gas.—The Haslemere Gas Company, Limited, will apply for an Incorporating Act (and the repeal of the Haslemere Gas Order, 1905), with the necessary financial and other provisions. The proposed area of supply includes a portion of the parish of Witley, now within the limits of supply of the Godalming Gas and Coke Company, Limited; and the repeal of that Company's powers in reference thereto is sought. Parliament will be asked to substitute a calorific power standard for the prescribed illuminating power; and to make other provisions.

Hemel Hempsted Gas.—Application will be made by the Hemel Hempsted District Gas Company for an Act to authorize them to erect new gas-works and to work-up and store residual products upon scheduled land. They wish for an extension of the limits of supply to include the part of the parish of Redbourn not within their existing limits, and to purchase the undertaking of the Redbourn Gas Company; for relief from obligation in connection with the illuminating power of the gas; for further capital powers; for authority to grant pensions, &c., and put in force a co-partnership scheme; and to be enabled to supply gas in bulk or purchase gas in bulk or gas in a partially purified or crude state.

Kenilworth Gas.—Notice is given by the Kenilworth Gas Light and Coke Company, Limited, of their intention to apply for an Act of Incorporation, with the requisite financial and other provisions. The proposed limits of supply are defined; and the Company will ask for the repeal of so much of the Leamington Priors Gas Company's Act of 1865 as authorizes that Company to supply gas within any portion of these limits. Provisions will be asked for to permit of profit-sharing with the employees; and to authorize the payment of superannuation allowances, and pensions to dependants.

Lea Bridge District Gas.—Notice is given by the Lea Bridge District Gas Company of their intention to apply for power to construct, improve, or discontinue works and plant in connection with the manufacture of gas and the treatment of residual products; to raise further capital; to form certain funds; to grant pensions, &c.; to make provisions with regard to the supply of gas; to vary the prices charged according to the purpose for which gas is used; and to purchase gas in a partially purified or crude state.

North Cheshire Water.—The object of an application by the North Cheshire Water Company is to enable them to enter into an agreement for a further supply of water by the Manchester Corporation; to alter and increase the existing rates and charges; to raise further capital; to hold annual meetings; and to grant pensions and allowances.

Sheffield Corporation Water.—Various powers are sought by the Sheffield Corporation—largely in connection with their electricity undertaking. It is desired to extend the existing city boundary so as to include part of the parish of Rotherham, and to increase the limits for the supply of water to include the added area.

Sheffield Gas.—The main points of the notice given by the Sheffield United Gas Light Company were stated in the "JOURNAL" last week [p. 404].

South Staffordshire Mond Gas.—Application will be made by the South Staffordshire Mond Gas (Power and Heating) Company for authority to increase the charges made for gas; to apply the increased scale to existing agreements; to make provision with respect to the application of profits; to provide for the establishment of reserve and other funds; and to increase their capital and borrowing powers.

PROVISIONAL ORDER APPLICATIONS.

Port Glasgow Water.—The Burgh of Port Glasgow will apply to the Secretary for Scotland for a Provisional Order to authorize them to provide an additional water supply to the district; to construct new works; to appropriate supplies of water; and to define the limits of supply.

Rickmansworth and Uxbridge Valley Water.—Application is to be made to the Board of Trade by the Rickmansworth and Uxbridge Valley Water Company for a Provisional Order to extend their limits of supply, construct additional works, and raise further capital.

Stretford Gas.—Application is to be made to the Board of Trade by the Stretford Gas Company for a Provisional Order under the Gas and Water Works Facilities Act, 1870, and the Gas and Water Works Facilities (1870) Amendment Act, to authorize the construction and maintenance of additional works for the manufacture, conversion, and storage of residual products; to alter, amend, or repeal as necessary for the purposes of the Order provisions contained in the Company's existing Acts; to incorporate all or any of the provisions of the Gas-Works Clauses Acts; and to vary all rights and privileges which would interfere with the Order.

Tonbridge Gas.—The Tonbridge Gas Company give notice of their intention to apply to the Board of Trade for a Provisional Order to extend their limits of supply to include that part of the parish of Shipbourne which is not within the Company's existing limits, part of the parish and urban district of Wrotham, the parish of Sevenoaks Weald, that part of the parish of Leigh which is not included in the Company's existing area, part of the parish of Penshurst, so much of the parishes of Hadlow and Hildenborough as is not within the Company's existing limits, part of the parish of Bidborough, and that portion of the parish of Tonbridge Rural which is not within the Company's existing limits. The Company will ask for power to erect works in connection with gas and residual products; for further powers for the working-up and conversion of residuals; for the substitution of a calorific standard for the illuminating power standard; for relief from restrictions as to sulphur and sulphur compounds; for further capital; and for authority to enter into an agreement with the Southborough Urban District Council with respect to the supply of gas by the Company within the Council's area.

HOUSE OF COMMONS.

Primitiva Gas Company and the Municipality.

Sir J. D. REES asked the Under-Secretary of State for Foreign Affairs whether any protest has been made by him to the Buenos Ayres Government regarding the failure of the Buenos Ayres Municipality to pay the Primitiva Gas Company for gas supplied to the value of £150,000 or to bring to a satisfactory conclusion subsequent negotiations for meeting the Primitiva Company's just claim.

Lord R. CECIL: The matter has not been brought to the notice of the Foreign Office; and no such protest has been made.

Sulphate of Ammonia.

Sir ALFRED MOND (in the course of a debate on food prices) said: From this country you are exporting food in large quantities—not in a consumable form perhaps, but you are exporting large quantities of nitrogenous manures, and, after all, that is food. The Board of Trade, in a recent report, admitted clearly that the land in Germany before the war was producing much more food per acre than that in this country. Why? Because they are using more artificial manures. It is therefore not a question merely of increasing acreage, and thereby necessitating more labour and other things, but it is a question of increasing the production of the land already under tillage. What have the Government done towards this? Absolutely nothing. Worse than that, we have exported from this country—we are doing it to-day—thousands of tons of sulphate of ammonia, the most valuable manure, by means of which we could increase by 50 per cent. the wheat crop of this country. I shall be told, no doubt, that the farmers have been informed on this point, that circulars and leaflets have been issued to them, and that many speeches have been made begging them to do these things. But it is not enough at a time like this. You want to go much further. You want to make it easier for the farmers to do these things. You ought to have experts going up and down the country visiting the farmer, and talking to him. You might even compel him to use a certain amount of manure on a given acreage of land. But none of these very elementary steps has been taken.

Mr. ACLAND (Parliamentary Secretary to the Board of Agriculture): We made a special arrangement in the autumn of last year, under which farmers were able to obtain sulphate of ammonia at a specially low price. The right hon. gentleman asked why we did not hang-up exports, so that more of this very important fertilizer will be available. We absolutely prohibited export for two-and-a-half months. We held on the prohibition of exports so long—many people thought too long—that such accumulations of stocks took place that there was a chance, or a threat, that works would have to discontinue manufacturing articles which were absolutely vital for the Ministry of Munitions; and, of course, when this fact became apparent, we had to allow, under

licence and control, export to again take place. The total manufacture of sulphate is something like 400,000 tons a year; and the total amount used by the farmers is about 50,000 or 60,000 tons. We have every prospect of increasing the use of it to something like double, I should think, in the present season. If with a set of people who, as he has said, are rather slow to move, what we have done will result, I believe, in doubling their consumption of a certain fertilizer this season. I think it is not fair to say it amounts to absolutely nothing.

LEGAL INTELLIGENCE.

A PREPAYMENT METER DISPUTE.

Sitting at Pembroke Dock County Court recently, his Honour Judge LLOYD MORGAN, K.C., had before him the case of *Morgan v. Pembroke Docks and Town Gas Company*, in which the plaintiff claimed the sum of 1s. placed in a prepayment meter which was removed from his premises before he had had an opportunity of consuming the gas which he had thus purchased.

Mr. F. E. GREATHEAD appeared for the plaintiff; and Mr. MARLAY SAMSON (instructed by Messrs. Lowless and Lowless) for defendants.

Mr. GREATHEAD said he thought the facts, as far as the claim was concerned, were really admitted. The money was emptied from the meter on Aug. 31; and owing, no doubt, to it not being in accord with the gas registered, the meter was removed on Sept. 1. On the former date plaintiff put 1s. in the meter, and did not subsequently use any gas before the meter was taken away. Therefore, he made a claim against the Company for a return of the money he had paid for a specific purpose which had not been carried out. It was admitted that the 1s. was there, because it was the only coin in the meter on Sept. 1. Instead, however, of returning it, they sent in a counterclaim for 1s. 1d. They said that since Aug. 17, 1915, the plaintiff had used 29,400 cubic feet of gas, of the value of £7 13s. 1d. The cash in the meter taken out at various periods during the twelve months amounted to £7 12s., including the 1s., leaving a balance of 1s. 1d., which they counterclaimed for. They based their counter claim upon an agreement which plaintiff apparently signed on Oct. 22, 1912. The material part of the agreement was a clause that, in the event of there being a difference between the automatic arrangement and the meter, showing that more gas had been consumed than was paid for, he agreed to pay for such additional quantity of gas as might be registered. Plaintiff applied for further particulars of the counterclaim, which did not show the amount of money that had been taken out at different periods on the readings of the meter. He had never been supplied with an account showing what was taken out of the meter at the various times or the amount of gas consumed. This counterclaim was the first application ever made by the Gas Company for any shortage. He had therefore asked to be supplied with the readings of the gas-meter at his house and the amount of money collected by the Company's employees since the meter had been fixed. This might seem a large order, because the meter had been there ten years. The reason for it was that it was really impossible to ascertain how the Company and the plaintiff stood, unless they had particulars of the amount of money paid since the meter had been installed to compare with the readings taken from zero. It seemed to him it would be impossible to try the counterclaim until he had these particulars.

His HONOUR: I do not propose to adjourn a 1s. 1d. case, particulars or not. I do not know how long this case will last. If your client had written me, I would have forwarded the amount of the claim.

Mr. GREATHEAD: There is a question of principle involved. It is a matter which affects practically all consumers in the town.

Plaintiff, having borne out the opening statement, was cross-examined by Mr. SAMSON. He said that the meter was not taken away, but changed; and he was present at the time of the substitution, and offered no objection to the change. He admitted signing the agreement, but had forgotten all about it. He did not dispute the readings, as he was not in a position to do so. He believed some notice had been left at the house with regard to the increased price of the gas; but he did not remember reading it.

Mr. SAMSON submitted that the plaintiff had not really made out his case. By the terms of the Act, the registration of the meter was *primâ facie* evidence of the amount of gas consumed. Plaintiff had not proved by the registration of the meter that he had paid 1s. in excess of the value of the gas he had consumed.

His HONOUR: I do not see how he could do it. It is impossible.

Mr. SAMSON: I daresay it is; but that is just what he undertakes when he sets out to make a claim. The onus, he proceeded, was upon the plaintiff to show that he had not been supplied with gas which he had paid for; and the placing of 1s. in the meter did not prove this. The money put into the slot paid for the rent of the meter, a cooker, and two lights, as well as for gas. Plaintiff must satisfy the Court how much of the 1s. was allocated for the payment of gas alone.

His HONOUR said he considered a case had been made out by the plaintiff, and suggested the calling of evidence as to the amount of gas consumed as registered by the meter.

Mr. *W. B. Mimmack*, the Manager of the Company, explained the automatic arrangement by which the consumer could prepay for gas used. This arrangement, he said, was as a rule very reliable; but it was found from time to time that there was a variation in the figures shown by the two sections of the meter. If the balance was in favour of the consumer, the Company returned the money; otherwise they claimed for the balance from the consumer, unless the difference was very trifling. He gave details showing that in the past twelve months plaintiff had consumed 1s. 1d. worth more gas than he had paid for, including the 1s. in the meter when it was removed.

Cross-examined by Mr. GREATHEAD, witness said receipts were not given by the Company's employees for the money collected from such meter; and the consumers would have no knowledge of the amount paid in by the employees to the Company. He could not give figures as to the amount of gas registered as far back as 1912, because the cards were destroyed; but he could say that the further they went back, the larger was the amount due from plaintiff to the Company.

His HONOUR said he was satisfied the Company had made out a perfectly good counterclaim. The plaintiff had made out his claim; but as the counterclaim was slightly larger than the claim, he should give judgment for the defendants.

Mr. SAMSON applied for costs on the higher scale.

His HONOUR said that he did not think the case came within the section giving him power to grant this.

Hulton Collieries Secure Power to Produce Gas and Electricity.

Last Tuesday, in the Chancery Court, St. George's Hall, Liverpool, Vice-Chancellor Stewart Smith granted an application by the Hulton Collieries, Limited, for power to manufacture gas and products and generate electricity from their coal. Mr. Baxter, in making the application, said the Company wanted an extension of their powers so that, instead of selling their coal to consumers and gas undertakings, they would be able to manufacture gas, generate electricity, and extract those valuable bye-products for which at the present time there was a great demand for use in the manufacture of high explosives and to make aniline dyes, synthetic drugs, &c. The Company was established in 1886, and had been highly successful. Their capital was £45,000 fully paid up. They owned two collieries—one near Bolton, and the other near Prescot, eight miles out of Liverpool. For several years the Company had been experimenting with the object of seeing what kind of bye-products they could supply. The result was they had come to the conclusion that they could do what very many other collieries had done; hence their application for the powers now sought. There was no intention to take up or interfere with roads. Mr. Rutherford opposed on behalf of the Atherton Urban District Council and seventeen holders of long leases in the neighbourhood of the collieries. The Council were, he said, themselves manufacturers of gas, and did not wish to have competition in this direction so close to them. They were willing to withdraw their objection if they could have an undertaking by Sir William Hulton that the projected works were not carried out so far as the Bolton Colliery was concerned. Mr. Baxter took formal objection to Mr. Rutherford appearing for clients who were not themselves shareholders of the Company. The Vice-Chancellor upheld the objection, and granted the order asked for.

A Claim of the Coal Distillation Company.

In the Chancery Division of the High Court of Justice, last Tuesday, Mr. Justice Neville had before him a summons by the Liquidator of Messrs. Walker, Maynard, and Co., Limited, for a declaration that the Coal Distillation Company, of Middlesbrough, were not entitled to prove as creditors in the liquidation, and for a similar declaration in regard to Messrs. Dorman, Long, and Co., Limited. Mr. Neilson said he appeared for the Coal Distillation Company, which was an English branch of a Dusseldorf concern. Messrs. Dorman, Long, and Co. had now made a proposal which would put an end to all the disputes between the parties; and he asked for time, in order that a letter might be sent through the Board of Trade to Dusseldorf, to see if the offer would be accepted. Mr. Whinney (for the Liquidator) said that, in a King's Bench action, the Coal Distillation Company had stated that they were not a German concern, but an English one. When, however, it came to the point, instructions had to be got from Germany. Mr. Neilson replied that his clients, though not a company according to English law, were established at Middlesbrough; and they had a claim against Messrs. Walker, Maynard, and Co. Messrs. Dorman, Long, and Co., as purchasers of that firm's undertaking, were bound to indemnify the firm, but were not bound to the Coal Distillation Company; and this was one of the difficulties in the case. In the King's Bench Division, there was an action by Messrs. Walker, Maynard, and Co. against the German Company, for a declaration that an agreement with regard to the erection of coal-distilling plant at their works was void, owing to the war. The Dusseldorf Company, by their defence, asked for a declaration that the agreement was in force; and there was a counterclaim by them. But in this action Messrs. Dorman, Long, and Co. had by order been substituted for the original plaintiffs. His Lordship said that, as the whole dispute would probably be terminated by the acceptance of the offer now mentioned, the best thing would be to direct the Liquidator to retain £2375 in respect of the Coal Distillation Company's claim, and let the summons stand over generally, with liberty to the parties to apply to restore it if necessary.

Metropolitan Water Board.—At their meeting last week, there was some discussion by the Metropolitan Water Board on the subject of the discontinuance of the erection of the new offices in Rosebery Avenue, as required by the Ministry of Munitions. The interruption of the building operations involved additional expenditure in placing the partially-erected building in a proper state of protection against the weather; and this cost might amount to £3500. A question had arisen as to whether the Contractors were liable. In Counsel's opinion, the liability rested with the Contractors under the terms of their contract; and the Board agreed to call on them to do the work. If they fail to comply, the Board will do what is requisite at the Contractors' expense. A report was presented on a successful experiment in sterilization which had been applied by Dr. Houston (the Director of Water Examination) to water at Staines and Hampton. The treatment consists of adding to the water a cheap substance which renders it safer than if it were first pumped into the Staines reservoir and stored there. As the treatment does away with the necessity for pumping, the saving from June to September was over £3000. Dr. Houston stated that the water had been free from any smell, taste, or noxious ingredient.

MISCELLANEOUS NEWS.

ORIENTAL GAS COMPANY, LIMITED.

The Ordinary General Meeting of the Company was held last Wednesday, at the London offices, Finsbury House, Blomfield Street, E.C.—Mr. H. D. Ellis in the chair.

The Secretary (Mr. S. Rainer) read the notice calling the meeting; and the Directors' report and the accounts were taken as read. The Auditors' certificate was read.

The Late and the New Secretary.

The Chairman said this was the third annual meeting at which the proprietors were assembled with the country at war. The Angel of Death had been abroad in many lands, spreading destruction and desolation far and wide. Since they were there last, the shadow of his wings had fallen upon that peaceful spot; and the familiar presence of their good Secretary (Mr. Luff) had passed away from them for ever. He was seized with a painful and grave malady in the early autumn, against which he struggled manfully and courageously, but in vain; and on Sept. 17 he succumbed. It was a great blow to them who had sat there and worked with him for twenty-three years. They passed a unanimous resolution, testifying to their deep sorrow at his tragic end, recording their high appreciation of the faithful services he had rendered to the Company for so long, and conveying an expression of their heartfelt sorrow to Mrs. Luff and the members of his family. He (the Chairman) was sure the proprietors would desire to unite themselves with the Board in these sentiments. Having done this, it became the duty of the Board to take steps to continue the business of the Company in the usual form, and to fill the vacant office of Secretary. Happily, they had among them a gentleman who, coming into the service of the Company as a youth, had grown up in that service for a quarter of a century, until he had now reached middle age—to look at him, a very robust middle age he (the Chairman) thought the proprietors would say. The Directors knew Mr. Rainer well. He had been intimately acquainted all these years with every detail of the Company's business in this country; and he knew all the staff out in India. The Board felt confident he was a thoroughly competent and capable person to undertake the secretaryship; and they appointed him accordingly. He need only add that, during the short experience they had had of him since the day of his appointment, they felt well assured they had made a wise choice.

Unusual Difficulties.

The Chairman, moving the adoption of the report and accounts, said that, as mentioned in the report, the progress of the Company had had its smoothness ruffled a little by some difficulties; but they had not had such a difficulty as they had a year ago. There had been no piratical appearance of a German cruiser in the Bay of Bengal, sinking ships and cargoes, and paralyzing the trade and seaborne commerce of Calcutta. Their difficulties had arisen from obstacles necessarily imposed in sending out goods and commodities to Calcutta. The proprietors were perhaps aware that there was a very formidable list of goods and commodities the export of which was prohibited by the Government. They were matters that entered into the everyday life of a gas company; and among them he need only specify iron and steel goods, copper, nickel, leather and rubber goods, incandescent mantles and mantle material, chimneys, and he did not know what else. In some instances, it was possible to obtain permission to export some of these goods. But it took a great deal of time. They had first of all to obtain from one Government Department a licence for the goods to be manufactured; and then, when the manufacturer was in a position to deliver, they had to get from another Department another licence to export. Even when the goods were in the docks, they did not know whether or not the ship might be commandeered by the Government. And in point of fact, until they saw the ship sailing out of the harbour, they never knew if the goods were going off. These were some of the difficulties. But difficulties had to be surmounted; and the surmounting of difficulties tended to toughen the moral fibre of a man's character and develop the best that was in him. If they could not be surmounted, they had to be bye-passed, and a compulsory resort to expedients, had often lighted a path to new discoveries. They had been hindered, but they could not complain.

Expansion of the Basis of Business.

They had been successful in maintaining during the year a full supply of high-quality gas to their customers in Calcutta, and he believed to their entire satisfaction. Chief among their consumers was the Municipality of Calcutta. The Chairman of that important body was in the habit every year of giving to his colleagues a report upon the proceedings of the year; and last August he, in his review, said: "The street lighting was maintained at a high standard throughout the year; satisfactory gas pressures being everywhere recorded." This was satisfactory proof. Then the Chairman of the Municipality went on to deal with other lighting matters, among which was the statement that the public gas-lights had increased from 11,900 to 11,997—this was 97 more. This, too, was satisfactory. Of course, they had, in addition to those of the Municipality of Calcutta, many other public lamps in the city. It was a vast city; and there were Suburban Municipalities. Altogether, they had rather more than 13,700 public lamps. This year, too, they had a nice accession of private consumers requiring gas for all purposes—light, heat, and power. In the domestic range of business, there had been a large demand for gas-cookers, which were installed in private houses, in hotels, and in clubs. For trade purposes, gas was also required for a multiplicity of things; but he had the great pleasure of informing them that they were supplying gas to Government munition factories which were engaged in turning-out shot and shell.

Features of the Accounts.

Turning to the accounts, the gas revenue was slightly lower. Last year it was £64,000; this year, £63,550. Residual products were also lower in amount, entirely owing to their not having manufactured as large a quantity of coke. This arose from the very gratifying cause that economies had been effected in the carbonization of coal. As to the sales of coke, they had done very well, although not making so much for sale as the year before. In tar there was a slight increase. In sulphate of ammonia there was a considerable increase in returns. Sulphate of ammonia was the youngest of their departments; and they were watching the upgrowth of it with pleased attention. On the other side of the account, the item of coal, purification and wages showed a saving of no less than £4333. In regard to this, a word of praise was due to their coal factors, who had been sending them good coal. What Mr. Snelgrove had done with the coal was the subject of the Board's gratitude. A year ago he had improved his carbonization so much that the output of gas per ton of coal showed an increase between 500 and 600 cubic feet. This year he had made a similar increase upon that increase—raising the output by another 500 or 600 cubic feet. The result was they had not had to carbonize so much coal by a large quantity. The item of unaccounted-for gas was also most satisfactory. Passing to mains, meters, services, and fittings, it was £1621 less. As mentioned in the report, they had not under war conditions been able to launch out into many extensions. They had, however, been doing good work for the Calcutta Improvement Trust. This powerful body was engaged in beautifying and improving the thoroughfares and districts of the Metropolis. They had just raised a loan of half a crore, which was £333,000 sterling. It seemed to him (the Chairman) the Trust was determined that Calcutta's nose should not be put out of joint as Queen City of India by the new capital of Delhi. He hoped the increased work of the Calcutta Improvement Trust would conduce to more gas being used. In fact, their fine work could scarcely be crowned otherwise. The next item of wear and tear of works showed an advance of £1675; a very proper expenditure indeed, as it ensured that most vitally important feature in the economy of a gas-works—viz., the maintenance of the buildings and plant in a thorough state of efficiency. He would not read all that their Manager said in his report; but he could give some extracts from it. Speaking on this subject, he said that the retort-houses, coal and coke stores, stoking machinery, and power plant had received full attention, the sulphate of ammonia plant had been reconstructed, and the railway lines inside the works had been relaid. He concluded as follows: "As will be gathered from the above detailed description of repairs and maintenance, the buildings and plant at the Sealdah works are in first-rate order. These works will now compare favourably with the majority of English gas-works. On the upkeep of works, the outlay during the year under review has been heavy; but this will not be a large annual recurring expense, as no extensive repairs will now be necessary for some time to come." In regard to the smaller works at Howrah, in speaking of the condition of the works and plant generally, Mr. Snelgrove said: "All the buildings and plant have been properly overhauled, and are in first-rate condition." The only other item to which he need now draw attention was that of bad debts and allowances. This showed a considerable increase. But it contained a batch of old arrears which they had reason to regard as becoming more and more doubtful; and it was not desirable to bring them forward in the balance-sheet as money due to the Company. Accordingly, they had written off the amount; and he might tell the proprietors that the eminent firm in Calcutta who acted as their auditing accountants were in entire harmony with the policy of the Board.

The Balance-Sheet.

Turning to the balance-sheet, he should have little to say. On the debit side, the exchange equalization account showed an improvement of £159. The amount due by the Company had been reduced by £2254. The loan at the bank had been reduced by no less than £8100. In the profit and loss account, it would be seen that this had resulted in the interest paid to the bank for loans being less this year by £188. On the credit side of the balance-sheet, the amount due to the Company had been purged of the doubtful debts of which he had spoken. Altogether it had been reduced by £5500. This was largely owing to the policy introduced about two years ago of giving the consumers a direct advantage if they paid prompt cash. Cash in Calcutta and London and bills receivable were £322 higher than this time last year. The result was an increased balance applicable to dividend. This, he thought, summed up all he had to say on the accounts. If it had given the proprietors as much pleasure to receive and peruse the accounts as it had given the Board to prepare and issue them, they were quite content.

Indications as to the Future—Sulphate of Ammonia.

Having now reviewed the history of the past year, he might conclude; but he thought the proprietors would perhaps care to have from him a few remarks regarding indications as to the immediate future. He was not going to indulge in any prophecy; but he would offer one or two observations upon the great land in which they had embarked their capital, and from which they derived their revenue. They might perchance interest the proprietors, and might afford some idea of what India is now looking forward to. Recently, an Indian gentleman—a member of the Viceroy's Council, and one speaking with knowledge and authority—declared that "India was never as prosperous as she is to-day, and is daily becoming richer and richer—particularly her agrarian classes." This last phrase was very significant. "The wealth of the Indies," had been a familiar expression for generations. It used to be accepted as connoting Golconda mines, and vast hoards of jewels and gold in the treasure houses of Rajahs. They knew better now. The wealth of the country lay in its natural products; and the most precious of these endowments might be epigrammatically summed up in two words—Food and Fuel. Let them take food first. Agriculture was by far the most important occupation of the people of India. In British territory alone, the acreage under cultivation was three times as large as the entire surface of the United Kingdom. The great mass of the agriculturists of India were small holders, mostly growing only for themselves, for their own necessities as a vegetarian people, having no knowledge of foreign markets, fettered by want of working capital, and unable to borrow except upon exorbitant terms. But the enlightenment of the peasant had been commenced, and was progressing. The establishment a few years ago of co-operative credit societies,

whose members could obtain advances in the money market, initiated the solution of the working capital difficulty, while scientific farming was now being taught in a series of fully equipped agricultural colleges. Already extraordinary improvements had been wrought in wheat and tobacco, and to a less extent in cotton. Wealth was fluid; and the prosperity of a community would percolate into many channels. He hoped it might find a channel in the direction of the Company; and certainly in one respect the agricultural advance should touch them closely. In India, there was always a scarcity of natural manure. It was not the native custom to use litter; and consequently the liquid manure was lost, and the solid matter was dried, and burnt as fuel. Here surely there should be a vast field for artificial fertilizers; and he thought they might look forward to an increasing demand for sulphate of ammonia as scientific agriculture progressed. He would only add that other industries were at the same time receiving the attention of the Government. A very strong Commission to examine the question of the expansion and development of Indian manufactures and industries in general had been appointed. He believed it had just held its first meeting; and the Government had every hope that its work would result in the stimulation of existing industries, the foundation of others, and the increase in the material prosperity of the people of India. In this prosperity, he hoped they might participate. With regard to fuel, the second element of wealth, India was rich in coal—both steam and gas coal—having vast fields, the total extent of which was beyond conjecture. India was rich also in oil; the Burmese fields having a vast productivity of high-quality material. So the natural wealth of India was not surpassed. He would not pursue this fascinating subject at greater length; but enough had been said to indicate that India had a great future before her.

Mr. ROBERT MILLER seconded the motion.

Mr. LOUIS PENNY thought it a matter of congratulation that the Directors, under the difficulties the Chairman had shown them, had been able to present such an admirable report. That the Company had been well managed was proved by the payment of an 8 per cent. dividend for the year. At the same time, it must be remembered that the 8 per cent. was not the same 8 per cent. they had had to his recollection for the last twenty to thirty years, because up to last year they had it free of income-tax. Now that the income-tax had increased, the dividend was practically only 6 per cent. But they could not help that. He thought the Board might give them more information in the accounts—for instance, as to the quantity of coal carbonized, the amount of gas made, and the quantity sold to public and private consumers, because such information would enable the proprietors to reckon the cost per 1000 cubic feet in all departments of expenditure, which was after all the true test of good working.

The CHAIRMAN replied that, in regard to the dividend, although this was not the same to the proprietors under present circumstances, it was the same to the Company. The 8 per cent. had come out of the Company; and if they were to pay 8 per cent. and another 5s. in the pound, which was 2 per cent., to the proprietor (and a personal charge upon him) it would mean a dividend of 10 per cent. They must each and all bear their own personal burdens. As to the accounts, he did not know whether it would be advisable to give all the information for which Mr. Penny asked, similar to the schedule form attached to the Gas-Works Clauses Act, 1871. This was not desirable everywhere.

The motion was unanimously carried.

On the proposition of the CHAIRMAN, seconded by Mr. W. WILLIAMS, a dividend of 8 per cent., less income-tax, was declared for the twelve months ending June 30, less 3½ per cent. paid on May 31 last.

Moved by Mr. A. TENNENT EASTMAN and seconded by Mr. STANLEY H. JONES, the retiring Directors (Messrs. Ellis and Williams) were unanimously re-elected.

Proposed by Mr. PENNY, and seconded by Mr. W. C. ELLISON, the retiring Auditors (Messrs. S. W. Savage and Frederick Seel) were re-appointed.

Mr. SEEL, in acknowledging the re-election of his colleague and himself, desired to say how much he sympathized with all the Chairman had said regarding the late Secretary, and to confirm the praise of the Chairman regarding their present Secretary. No Secretary could take more pains in going absolutely into minutiæ to make things clear to the Auditors. As one of the proprietors, as well as an Auditor, he felt they could congratulate themselves on having such a capable successor to their late respected Secretary.

The CHAIRMAN proposed a vote of thanks to the Manager, the Secretary, and the staff generally. The Board, he remarked, might devise the soundest policy, might elaborate the most sagacious plans, but they knew perfectly well that, unless they had a staff of efficient, capable, devoted, and loyal officers out in India, their plans would come to naught. They were especially happily situated in this Company. He had already said something regarding Mr. Snelgrove; and he repeated it emphatically. He was an admirable Manager, and quite master of his business. He never spared himself, and he had a good staff under him; and to them they also tendered thanks. As to the Secretary, he (the Chairman) was pleased to hear the testimony of Mr. Seel. The Board believed they had made an excellent choice.

Mr. MILLER, in seconding the motion, said he could speak from personal observation of Mr. Snelgrove, as he was in Calcutta some two years ago. He could confirm everything the Chairman had said as to the efficiency of the Manager and his staff.

The motion was cordially passed.

Mr. RAINER said he should have much pleasure in conveying the kind vote of the proprietors to Mr. Snelgrove and his staff. It would be appreciated that they had to bear the greater burden in conducting the business at the seat of operations; but here in London they also had their responsibilities. He should be only too glad to do his very best in the post with which the Board had honoured him, and to carry out to the best of his ability their instructions. Regarding his late

"But what shall I do with the rubbish I used to burn up in the Kitchen Range?"

¶ The only Stove that completely answers this question is

The DAVIS DOMESTIC "BURN-ALL"

THE DAVIS GAS STOVE CO., LTD., *The Gas Exhibition Salons*, 60, OXFORD ST., LONDON, W.

chief (Mr. Luff), the Chairman would probably allow him to echo his expressions of regard for him. He worked with Mr. Luff twenty-four years; and the proprietors would readily understand that a loss like this was not a small one. He missed him greatly; and now he should do his best to carry on the work Mr. Luff did.

On the motion of Mr. MITCHELL, seconded by Mr. ELLISON, a hearty vote of thanks was passed to the Chairman and Directors.

WELSBACH LIGHT COMPANY, LIMITED.

An Agreement for the Sale of the Austrian Shares.

Meetings of the holders of debenture stock and shares in the Welsbach Light Company, Limited, are to be held to-day for the purpose of considering an agreement that has been made, with the consent of the Government, between the Company and the Deutsche Gasgluhlicht Aktiengesellschaft (Auergesellschaft), called the "D.G.A." The essential features of the agreement are: The sale to the D.G.A. of the 1478 shares (with accrued dividends) in the Austrian Company, the release of the D.G.A. from its guarantee of the Welsbach Company's debenture stock, and the delivery to the Austrian Company of certain share and loan certificates relating to Henry Hill and Co., Limited G.m.b.H. In consideration for this sale, release, and delivery, the Welsbach Company is to obtain 173,048 shares, and £62,597 of debenture stock owned by the D.G.A. in the Welsbach Company, dividends and interest thereon from August, 1914, to date, amounting (less tax) approximately to £9710, cancellation of three debts owing by the Welsbach Company to German and Austrian companies aggregating £3154, and £1000 cash out of funds in the hands of the Public Trustee for account of the D.G.A.—the latter, however, having the option to satisfy such cash payment by further debenture stock of the Welsbach Company taken at the price of 70 per cent. The agreement was made conditional upon the sanction or approval of the Board of Trade, the Public Trustee, the High Court of Justice, the members and debenture stockholders of the Company, and also the German Government, being obtained within three months from Sept. 29 last.

When the scheme is completed, the issued share capital will, by the retention unissued of 90,000 shares, stand at £175,000 in shares of £1 each; and the debenture stock will, by the cancellation of £104.595 of stock, be reduced from £204,595, at which it at present stands, to £100,000 of stock. Shareholders and stockholders will have the right of subscribing for 83,048 shares at 11s. per share.

The Welsbach Light Company, Limited, is a reconstruction of the old Welsbach Incandescent Gaslight Company, Limited, which was formed in 1897 with a capital of 3½ million pounds. A reduction of capital took place in 1904; and in 1911 the Company was reconstructed. Each preference shareholder in the old Company received on reconstruction 3s. 4d. in cash and 8s. in debenture stock of the present Company. Each ordinary shareholder of the old Company received 2-15ths of a share in the present Company. To provide the cash for the payment to the preference shareholders, the German Company referred to in the scheme subscribed 100,000 shares at par—a holding increased by commission shares and by purchases on the market in their own name and in the names of nominees. In respect of this shareholding, the German Company have never obtained a dividend return, as until last year the Welsbach Company had only paid the debenture stock interest and provided a sinking fund for the redemption thereof. From 1913 onwards, the Company's trading position has improved, as was shown by the successive reports and accounts, though, of course, no dividend has been received during the last three years from the shares in the Austrian Company acquired in in 1911 and standing in the Company's books at £179,617.

The British investors in the Company (4200 holdings) own approximately £225,000 (nominal) of debenture stock and shares, which represents the remains of the original investment before mentioned.

COKE FUEL FOR ELECTRIC POWER STATIONS.

The Highways Committee of the London County Council have placed an order for eight coke-burning mechanical stokers for use under the steam-boilers at the Greenwich generating station—an important step being thus marked in the development of coke sales for which the London Coke Committee was established.

It is calculated that the first sets of stokers now contemplated will, if worked to full capacity, consume 100 tons of coke per 24 hours. The present total coal consumption at the power station has been estimated at 165,000 tons per annum; and, according to a figure recently published, the present price is 32s. per ton. The financial advantages which should accrue to the Council from equipping their boilers with stokers permitting of this alternative source of fuel supply should be considerable.

Calorific Standard in London.—In the report they submitted at the meeting of the London County Council on the 14th inst., the Parliamentary Committee said: The Gas (Standard of Calorific Power) Bill contained proposals to enable the appropriate Government Department (the Board of Trade in the case of gas companies, and the Local Government Board in the case of local authorities supplying gas) to make, on the application of the company or authority, an Order substituting a standard of calorific power for the prescribed standard of illuminating power, substituting tests for calorific power in lieu of those for illuminating power, and imposing penalties for deficiency in calorific power and exempting the undertakers from penalties in respect of deficient illuminating power. Out of the six Companies supplying gas in London, only two—the South Metropolitan and the Commercial—are not subject to a standard of calorific power. The Public Control Committee did not consider that any action was necessary upon the Bill.

The "Fire Queen"

The Latest "Main" Gas Fire.

It is designed to co-ordinate in size with *any* modern Interior Grate.

The fire backs and heights overall are graded to coincide with the dimensions of Standard Grates. Note the appearance when in use. So like a bright coal fire, and it will pass all the "tests" for Efficiency and Ventilation.

R. & A. MAIN, LIMITED.

WORKS: Gothic Works, EDMONTON, N.; Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.
SHOW-ROOMS AND BRANCHES: 25, Princes Street, Oxford Circus, W.; 136, Renfield Street, GLASGOW; 83, Old Market Street, BRISTOL; 18, Sever.. Street, Deansgate. MANCHESTER; 97, Millfield, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

A LANARKSHIRE GAS COMPANY'S STANDARD.

At a Meeting of the Parliamentary Bills Committee of the Lanarkshire County Council, as reported to the Middle Ward District Committee on the 24th inst., a letter was read from Mr. Henry Downs, the Secretary of the Bothwell and Uddingston Gas Company, in which they gave notice of their intention to apply to the Board of Trade for an Order under the Gas (Standard of Calorific Power) Act, 1916, giving them power to substitute for the standard of illuminating power prescribed by their Order of 1902 a standard of calorific power of 500 B.Th.U. (gross). They also proposed asking power to make a corresponding substitution of the provisions for testing the gas, and to make such other ancillary or incidental provisions (if any) as may be deemed expedient, including any variation of the pressure prescribed for the supply of the gas by the Company.

In connection with this intimation, Mr. W. L. Douglass (the District Engineer) made a report to the Committee, in which he said the Company were empowered to manufacture gas of an illuminating power equal to that of 15 sperm candles. The Gas (Standard of Calorific Power) Act was, he understood, brought into force in order to protect gas undertakers who were debenzolizing their gas, with a view to supplying certain substances useful in the manufacture of munitions. He believed that in Scotland only two of the gas undertakings had, as yet, applied for an Order under the Act; but a large number of English concerns had done so. In practically every case a standard of calorific power of 500 B.Th.U. (gross) had been granted. Mr. Douglass observed that the Company were apparently following the standard practice in the matter, and that there need be no objection to their proposal, provided, of course, that the Local Authority's rights as to testing were properly safeguarded. The matter was largely a technical one; and perhaps it would be well to get the advice of a gas expert on the subject.

The Parliamentary Bills Committee, having heard the Clerk and the Engineer, resolved to recommend, having regard to the circumstances under which the Company's application was being made, that no objection be offered to the proposal for the substitution of the standard of calorific power mentioned. In view of the fact, however, that the Order of the Gas Company would contain proposals with respect to which no information was as yet available, the Committee recommended that the District Committee should reserve the right to state objections to such matters if considered prejudicial to their interests or those of their constituents. The District Committee adopted the recommendation, and agreed that the Clerk should take all necessary steps in the matter.

The District Committee had, previous to the war, contemplated the taking over of this and other Gas Companies in the Middle Ward. They had made various inquiries and entered into negotiations with this object in view, when the matter was allowed to lie over in the meantime.

DISASTROUS EXPLOSION AT THE DESSAU GAS-WORKS.

The "Journal für Gasbeleuchtung" of the 11th inst. reports that on Nov. 4, shortly before one o'clock, and during the general dinner hour, an extremely violent explosion occurred in the old purifier-house at the Dessau Gas-Works, which is one of the more important stations of the German Continental Gas Company.

The old purifier-house forms the north-west wing of the main works building, and not only was this wing and the attached central structure, in which were housed the steam-engines and exhausters, destroyed, but the roof was lifted from the south-east wing, which had recently been converted from a retort-house to an apparatus house—the second on the works. Both the end and side walls of this house were partially demolished; the roof falling inside the building. The explosion passed across the yard in front of it and shattered the windows and roof of the office and laboratory building. Within a radius of over a kilometre (five-eighths of a mile) many shop windows and large panes of glass were shivered in pieces. Fragments and the *débris* of the fallen walls and roofs damaged the exhausters and the principal steam-pipe; so that, although the retort-house, boilers, the two large gasholders, and the plant in the new apparatus house were not put out of action by direct damage, the gas supply to the town was interrupted. A fire which broke out in the old purifier-house, where a tar-tank had been shattered, was quickly extinguished.

Owing to the explosion having taken place during the dinner hour, only the foreman, the gatekeeper, a French prisoner of war, and a few workmen were injured by flying fragments; while in the town a few people were cut by splinters of glass. None of the injuries appear to be of a serious character. The material damage done is, however, very considerable.

The examination which was made in the presence of the authorities directly after the small fire on the works had been extinguished indicated, to all appearances, that the great disaster had been caused by the wilful act of someone. On clearing away the *débris*, it was found that the air-valves on all the purifiers of the old system had been opened, the plugs being at the side and the handles reversed. It is therefore suspected that one of the prisoners of war, who have been employed at the gas-works for a long time past, gained access to the purifier-house during the dinner hour and opened the valves. The foreman passed through the purifier-house in the course of his round half-an-hour before the explosion, and then noticed nothing out of order. The investigation is being pursued. It has not yet been ascertained how the gas was ignited.

The Nottingham section of the Society of Chemical Industry will be addressed on the 11th prox. by Professor H. E. Armstrong, F.R.S., on "The Need of a National Fuel and Power Scheme."

THE "ZENITH" GAS HEATED BOILER.

is a COMBINED HEATER and STORAGE TANK complete with AUTOMATIC GAS VALVE (Thermostat).

The "Zenith."

Unequalled for providing constant supplies of Hot Water by day or night.

Especially valuable for use in Military Hospitals and temporary buildings devoted to the care of the sick and wounded.

Made in three sizes:—10, 20, and 40 gallons.

Full Particulars and Illustrated List on application to

ARDEN HILL & CO.,
ACME WORKS,
BIRMINGHAM.

THE CHALLENGE TO THE "MULTICOOKER."

British Commercial Gas Association's Proposal Declined.

The current issue of "Truth" records the tenour of the reply of Mr. T. C. Bench, the Director of Multicooker Inventions, Limited, to the challenge to them issued by the British Commercial Gas Association [*ante*, p. 351] to prove the gas-saving claims of their much advertised apparatus by a public test extending over a period. The remarks of our contemporary are as follows.

STATEMENT BY "TRUTH."

I have received a long letter from Mr. T. C. Bench, Director of Multicooker Inventions, Limited, in reply to the challenge from the British Commercial Gas Association for a test which would settle definitely the claims made in advertisements as to the gas-saving qualities of the "Multicooker." As the matter was one which to my mind can be settled best by an open test, and Mr. Bench declines the challenge, I see no use in devoting space to mere argument. The test offered him, as I remarked previously, was perfectly fair and equitable, since by its extension to a week's cooking for the meals of two typical families any occasional advantage in cooking a particular meal would be eliminated.

In his communication, Mr. Bench issues a counter-challenge. He proposes as a test the cooking of a single meal by the "Multicooker," and to save in the cooking of that single meal, not 75 per cent. of the gas used in a competing cooker, but 33 per cent. of an amount of gas which is stated in a gas company's pamphlet to have been used in cooking the same meal in some gas-cooker or other. This is, of course, no sort of a test at all of the merits of the "Multicooker," nor would it in any way answer the points at issue. Those points are quite clear. Does the "Multicooker," when installed in the kitchen, save 75 per cent. of the consumption of gas? Does it knock 15s. in the pound off the gas bill? The test proposed by the British Commercial Gas Association would have answered these queries definitely. The test proposed by Mr. Bench would not. In fact, in this letter, as in the previous one which appeared in "Truth," Mr. Bench has avoided giving any direct answer to these queries, which cover the points to which attention was originally directed in "Truth." I leave the public to draw their own conclusions.

Thirsk District Water Order.—Under the powers conferred on them by the Special Acts (Extension of Time) Act, 1915, the Board of Trade have extended, for a further period of six months from Jan. 29, 1917, the time limited by section 11 of the Gas and Water Works Facilities Act, 1870, for the substantial commencement of the works authorized by the Thirsk District Water Order, 1915.

NOTES FROM SCOTLAND.

Honorarium for Forfar Gas Manager.—An honorarium of £100 has been voted by the Forfar Town Council to Mr. T. W. Harper, the Gas Manager, in recognition of the extra work which has devolved upon him in connection with the installation of new carbonizing plant. The matter came before the Council in the form of a recommendation from the Gas Committee.

Gas-Works as Certified Establishments.—Attention was called by Mr. A. R. Harper (Town Clerk of Renfrew), at the Annual Committee of the Convention of Royal Burghs in Scotland, to the present position of municipal gas-works. A large number of municipalities, he said, owned their own gas-works; and as gas was largely used in the making of shells and other munitions, it was most important that there should be a continuous and uninterrupted supply. He suggested that steps should be taken to have these gas-works made controlled or certified establishments. The Chairman (Sir Robert K. Inches) remarked that he understood the municipality had only to apply to have them controlled. Mr. Burns said men had no right to strike at the present time. All public-utility services, which were as important as munition works, should be controlled. He moved that a representation should be made to the Government in the matter. Mr. Macdougall moved that the burghs be left to take action themselves. Many burghs might object to have this forced upon them; and they had no right to tie their hands. Ex-Provost Keith said that the difficulties they had with getting work carried on, on account of the threats held over their heads, were very great at the present time. The motion by Mr. Burns was agreed to.

Duties of District Foremen.—A practical paper on the subject of the "Duties and Difficulties of District Foremen" has lately been read by Mr. John Canning before the Glasgow Corporation Gas Department Foremen's Association. The author, who, being himself a district foreman, was perfectly well qualified to handle his subject, pointed out that the main duties of a foreman are to advise, measure, get work executed, and inspect jobs done—requiring tact, courtesy, and a thorough knowledge (both practical and theoretical) of all gas appliances. The thorough grasp which foremen should possess of all the latest appliances and their advantages, is often very difficult to obtain unless acquired from practical results which are gained after the apparatus has been fixed on the consumer's premises. Personally, he would advocate the provision of better facilities for gaining experience and information by the fitting-up of test-rooms on the department's own premises, where gas appliances could be installed and tested, and the details supplied to each foreman. Generally, the first thing a consumer did was to ask how much gas an appliance would consume, and whether it would be likely to suit; and the foreman would be on much surer ground in replying if he had seen similar apparatus under test, and had his proofs first hand. He then dealt with a number of the "daily trials" of the district foremen.

Clark's Flueless Heating Stove

The extraordinary popularity of Clark's Syphon Stove is due to these advanced working principles:—

The Phœn'x.

Made in TWO Sizes for Immediate delivery.

Its scientific method of generating Pure Heat under all conditions.

Its silent burning, and warm, cheerful effect.

Its simplicity in fixing; no chimney outlet is required and it can be placed anywhere.

Its low working and maintenance charges; its great efficiency and the full complement of designs for all styles of furnishing and decoration.

These features have secured its adoption not only by the civic population, but also by the military authorities, where it is doing good service in Military Hospitals, Convalescent Homes, Training Camps, etc.

Clark's Syphon Stove Co., Ltd.,

132, Queen Victoria Street, London, E.C.

Works: Warrington, Lancs.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Nov.* 27.

Pitch is in steady demand at 21s. net per ton at makers' works for export, and for home trade other than fuel purposes about 25s. per ton is obtainable. Creosote is being used for home purposes to an increasing extent; and the value is 4d. net per gallon in bulk at makers' works. Solvent naphtha 90-160 is in good demand; while there are inquiries for cresylic acid. Anthracene remains at 3d. net per unit, packages free.

Sulphate of ammonia is in a strong position, business in the 25 per cent. quality having been reported at £17 17s. 6d. net per ton filled into buyer's bags at producers' works for December delivery.

Tar Products in the Provinces.

Nov. 27.

The market for tar products keeps fairly steady. Pitch is still very difficult to sell. Solvent naphtha remains quiet, although the price is the same. Creosote appears to be a little firmer.

The average values of gas-works products during the past week were: Gas-works coal tar, 17s. 6d. to 21s. 6d. Pitch, East Coast, 16s. to 16s. 6d. per ton; West Coast—Manchester 15s. to 15s. 6d., Liverpool 16s. to 16s. 6d., Clyde 17s. to 18s. Benzol, 90 per cent., North, 10½d. to 11½d.; 50-90 per cent., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha, in bulk, North, 6½d. to 6⅝d. Solvent naphtha, naked, North, 1s. 10d. to 1s. 11d. Heavy naphtha, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 2⅞d. to 3d. Heavy oils, in bulk, North, 3d. to 3⅛d. Carbolic acid, 60 per cent., East and West Coasts, 3s. 4d. naked. Naphthalene salts, 70s. to 80s., bags included. Anthracene, "A" quality, 2¾d. to 3d. per unit; "B quality," ¾d. to 1d.

Sulphate of Ammonia in the Provinces.

LIVERPOOL, *Nov.* 25.

There has again been a strong market throughout the week, and higher prices have been paid at all principal ports with the exception of Hull. The delay in issuing export licences has caused shipments to fall considerably behindhand; but there has nevertheless been keen demand for all available supplies. The nearest values to-day are £18 per ton f.o.b. Hull, £18 5s. f.o.b. Liverpool, and £18 7s. 6d. f.o.b. Leith. A fair amount of business has been done in the forward position, and transactions have been reported at £18 12s. 6d. for January-June delivery at the best ports.

Nitrate of Soda.

The tone of this market is firmer, and holders on spot now require 18s. 3d. per cwt. for ordinary quality, and 18s. 9d. for refined.

Sulphate of Ammonia.

From another source, quotations are given as follows: Outside London makes, £16 17s. 6d. to £17; Hull, £17 12s. 6d. to £17 15s.; Leith, £18; Liverpool, £17 17s. 6d.; Middlesbrough, £17 15s.

Manchester District Tar Prices.

The average price that was realized for tar, based on the value of the products, for October deliveries in the Manchester district was 22s. per ton.

COAL TRADE REPORT.

Northern Coal Trade.

With rather heavier arrivals of steamers, coal shipments are fuller, though still a little below the average. In steam coals, the demand is fair. For best Northumbrians, the quotation is from about 27s. 6d. to 30s. per ton f.o.b.; for second-class steams, 25s. to 27s. 6d. is quoted; and steam smalls are from 17s. 6d. to 21s. The output is maintained, and is well taken up. In the gas coal trade, there is a full home demand; but shipments are a little interfered with, though the collieries have full order books, as a rule. Best Durham gas coals are from 27s. to 30s. per ton f.o.b., second-class are about 20s. to 21s. 6d., and "Wear" specials vary from 28s. to 30s. While gas coals are thus lower in price than they were six or eight weeks ago, there is the accompaniment of higher freights, except to the "scheduled" ports. From the Tyne to London about 15s. is the current freight; but variation with the weather is frequent. There are few contracts in the market at present; but those that are running take up much of the production, and there are fair exports to France—at "limitation" figures often. In other export instances, the current price of gas coals is much below what it was at midsummer—a rather unusual experience. But the large proportion of coal produced—steam, gas, and other kinds of northern coal—with prices restricted by law or by scheduled agreement, must have its effect on the current quotations. Good gas coke is from 32s. 6d. to 34s. 6d. per ton f.o.b.; and freights are relatively higher this week for its sea carriage.

Failure of Gas Supplies in Ireland.—Failure of gas supplies followed upon the floodings that resulted from the recent great rainstorms in South of Ireland urban areas. By the flooding out of the Bandon Gas-Works, the town was deprived of lighting for three successive nights.

Gas Fatality at Southsea.—Four people were rendered unconscious through a leak in a gas service-main at Southsea; and in one case fatal results ensued. At the inquest it was stated that a leak was discovered late at night; and the gas men, unable to effect complete repair, warned the residents in the neighbouring houses to keep their windows open. The following morning a lady and two children were found unconscious in one house, but recovered. Next door a Mrs. Wedeman was found in a serious condition, and died later. A verdict of "Accidental death" was returned.

PARKINSON
Gas Fires

Model: **COMPASS**

WHERE central heating is required, as it is in the case of Munition Works, Hospital Wards, Shops and Offices, the circular "Compass" fire is admirable; it radiates heat to all points of the compass.

The illustration very well shows the pleasing design, but leaves to the imagination the effect of cosiness.

Gas consumption is economical; the flue pipe itself provides a certain amount of convected heat from the waste gases.

A single tap (in a recess) controls the duplex burner—half or the whole of which can be used at will.

The Fender is in two parts; there are no openings at floor level through which dust can accumulate—the air inlets are at the top of the Fender.

All the wearing parts can be readily removed and replaced—they are standardized.

The Compass Fire Booklet will be sent at request.

The Parkinson Stove Co. Ltd.

Birmingham . Stour Street, Spring Hill.
London . . 129 High Holborn, W.C.

Liverpool Water Committee.—Acknowledging his unanimous appointment once more as Chairman of the Liverpool Corporation Water Committee, Colonel R. S. Porter said the demand for water for domestic and public purposes continued high, while that for trade uses was still at a steadily increasing rate. Recent appeals to the public, with a view to minimizing waste, appeared to have borne some fruit.

How to Bring About a Smokeless Leeds.—In a lecture drawing attention to the low-temperature process for the distillation of coal, Mr. S. F. Dufton, D.Sc., Inspector of Secondary Schools in the West Riding, told the Leeds Luncheon Club (at a meeting over which Mr. W. D. Helps presided) that a smokeless city would be the equivalent of 4s. or 5s. off the rates. Smoke could be abolished by distilling all coal before burning it; and everything at the moment combined to make this reform practicable. It would effect a saving for the whole country of £100,000,000 a year. They could never destroy disease until they opened up the slums to sunshine and fresh air. For the future no gas or electricity profits, he maintained, should go in reduction of rates. All should be applied to the reduction of capital charges and lowering to consumers the cost of light and power. Light and power are the very life-blood of industry. They are the bedrock necessities of business life.

Nottingham Gas-Workers' Wages.—Despite depleted revenue from the principal trading concerns, the Nottingham Corporation have succumbed to trade union demands, which, based upon the higher prices of commodities in war time, entails a somewhat serious financial outlook. Sir George Askwith's last award afforded the Nottingham gas-workers a substantial advance; and now they are to be given another 2d. per hour, where paid on the hourly basis, and 1s. extra per day or shift for all men employed on day or shift work, with equivalent advance to all piece-rate workers.

Tees Valley Water Board.—On being re-elected Chairman of the Tees Valley Water Board, Alderman A. Hinton, J.P., said they were hoping to get the sanction of the Ministry of Munitions to expend money usefully in laying down a line of pipes. They had reason to be satisfied with the increase in the consumption of water; and they were now reaping benefit from the wise expenditure of previous years. The report for the half year ended Aug. 13 showed that to date the capital cost of the undertaking had been £2,898,814. The income of £66,291 represented an increase of £3721 compared with the preceding half year, and an increase of £3097 over the corresponding half of 1915. The expenditure on revenue account of £13,284 was a decrease of £547 on the previous half year, and of £844 on the corresponding half of 1915. The balance carried forward was £53,007.

STOCK MARKET REPORT.

BUSINESS on the Stock Exchange continues in precisely the same unsatisfactory condition as that which we had to record a week ago. Quietude is scarcely the word—indeed, to hear some members talk, the only proper description of the "business" is that memorable one applied to the Snakes of Ireland—"there are none." Complaints loud and deep are levelled at the Chancellor of the Exchequer, who is accused of throttling the Stock Exchange with his financial measures, while at the same time he has muddled even these to such an extent as to miss securing the full fruition of those hoards of money which are to be had by the statesman who knows how to unlock them. And so things go drifting on, and the new War Loan, which is to be the "Open, Sesame!" may not improbably be a little farther off than was hoped.

Turning to other factors of minor power operating last week, the war has again presented two faces—the capture of Monastir and the general Western good points being set off by the Roumanian retirement. Although the gilt-edged market was sadly in need of support, Home Government issues did not do so badly on the whole; the War Loan and Consols taking a firm line the last two days, and Colonials finding some demand. In Home Rails, realizations of profits in Undergrounds induced ease. Americans did well at times, but were not altogether comfortable about labour questions, and Canadians took no heed of improved traffics. Argentines remained under depression, and the South African Market was quite dull.

The Foreign Market displayed irregularities. The French new Loan was in favour, and Chinese, Japanese, and Chilian issues came in for notice; but Brazilians were flat. There was most life in the Miscellaneous Market, where munitions, textiles, and ships were prominent, and which was enlivened by the Treasury sanction to three large new issues.

Business in the Gas Market piled-up but a poor aggregate, even though an unusual number of the less frequently participating issues now contributed to the array. Prices realized showed practically no change from the standard of the week before. In the Money Market there was a good demand, and discount rates were firm. The Board of Trade sanctioned a scheme for eliminating German interests from the British business of the Welsbach Light Company.

Bargains done for cash during the week were as follows: On Monday, Alliance and Dublin 63¼, 63½, Brentford "A" 86, 86½, ditto debenture 69, Commercial 4 per cent. 73½, 74, Gas Light ordinary 72⅜, 73, 73¼, Primitiva 40s., ditto preference 62s. 6d., 63s. 9d., 65s., South Metropolitan 84⅜, Tottenham "A" 117½, 120. On Tuesday, British 34¼, Imperial Continental 80, 81, Primitiva 40s., 40s. 7½d., South Metropolitan debenture 59, South Suburban debenture 88½. On Wednesday, Bournemouth "B" 11⅜, 11½, Gas Light ordinary 72½, 73, Primitiva preference 65s., ditto debenture 77½, 77¾, South Metropolitan 83¼. On Thursday, British 34¼, Bath 88, Cardiff 5 per cent. 89¾, Continental Union 36¼, Gas Light ordinary 72¼, ditto maximum 56½, 57, ditto preference 69¼, 69¾, Primitiva preference 65s. On Friday, Gas Light ordinary 72¼, 72½, ditto maximum 56½, Imperial Continental 79, Primitiva 42s. 6d. On Saturday, Gas Light ordinary 71½, 71⅜, 72, 72⅜, ditto maximum 56½, 57, Imperial Continental 80.

The Bank rate is 6 per cent.—as fixed on July 13.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Previous Div. and Bonus.	Last Dividend.	NAME.	Closing Prices, July 26, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
175,472	Stk.	Mar. 10	4	4%	Aldershot 4 p.c. Pref.	..	65—70	..
1,551,868	"	April 8	2½	5½%	Alliance & Dublin Ord.	59—64	62—64	63½—63½
874,000	"	July 10	4	4%	Do. 4 p.c. Deb.	76—79	60—65	..
990,000	5	April 29	7½	4/6	Bombay, Ltd.	5⅞—6⅛	4⅞—5⅛*	..
89,000	10	Feb. 26	16	15/-	Bournemouth Gas and Water { 10 p.c.	29—30	26—27	..
888,110	10	"	7	7/-	Bournemouth Gas and Water { B 7 p.c.	15—15½	11—11½	11⅜—11½
115,000	10	"	6	6/-	Bournemouth Gas and Water { Pref. 6 p.c.	13½—14	9½—10	..
159,740	—	—	—	4%	Bournemouth Gas and Water { 4 p.c. Deb.	..	73—75	..
992,045	Stk.	Feb. 26	†14	55/-	Brentford A Consold.	361—366	86—88	86—86½
734,920	"	"	†11	53/9	Do. B New	304—309	83—85	..
55,000	"	"	5	5%	Do. 5 p.c. Pref.	109—111	85—90	..
221,400	"	June 11	4	4%	Do. 4 p.c. Deb.	91—93	69—71	69
217,380	Stk.	Feb. 26	11	10½%	Brighton & Hove Orig.	208—213	160—165	..
244,200	"	"	8	7⅓%	Do. A Ord. Stk.	154—159	121—124	..
580,000	20	Mar. 26	12½	22/6	British	44—45	34—35	34½
120,000	Stk.	June 26	4	4%	Do. 4 p.c. Deb. Stk.	88—90	68—70	..
245,771	Stk.	June 26	4	4%	Buenos Ayres 4 p.c. Deb.	85—87	60—65	..
100,000	10	—	—	—	Cape Town & Dis., Ltd.	1½—2½	1¼—1⅝	..
100,000	10	—	—	4½%	Do. 4½ p.c. Pref.	4—6	4½—5*	..
100,000	Stk.	June 26	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	60—65	..
157,150	Stk.	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	82—83	..
1,513,280	Stk.	Feb. 12	5/9/4	49/4	Commercial 4 p.c. Stk.	106—108	72—74	73½—74
560,000	"	"	5½	46/8	Do. 3½ p.c. do.	103—105	68—70	..
475,000	"	June 11	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	55—57	..
800,000	Stk.	"	4	—	Continental Union, Ltd.	36—39	36—38	36½
200,000	"	"	7	—	Do. 7 p.c. Pref.	115—118	57—59	..
278,400	—	—	—	11⅛%	Croydon B and C 7 p.c.	..	175—185	..
—	—	—	—	10%	Do. E	..	..	..
492,270	Stk.	—	6	5⅞%	Derby Con. Stk.	128—.5	100—105	..
55,000	"	—	4	4%	Do. Deb. Stk.	102—104	80—83	..
1,002,180	10	July 29	10	7/6	European, Ltd.	17¼—18	12—13	..
16,313,430	Stk.	Feb. 10	4/17/4	42/-	Gas Light and Coke { 4 p.c. Ord.	98—102	72—74	71½—73½
2,600,000	"	"	3½	3⅛%	Gas Light and Coke { 3½ p.c. max.	76—79	55—58	56½—57
4,062,385	"	"	4	4%	Gas Light and Coke { 4 p.c. Con. Pref.	95—99	69—71	69½—69½
4,674,850	"	June 11	3	3%	Gas Light and Coke { 3 p.c. Con. Deb.	73½—74½	59—61	..
130,000	"	"	10	10%	Gas Light and Coke { 10 p.c. Bonds	..	..	..
258,740	Stk.	Mar. 12	5	4⅓%	Hastings & St. L. 3½ p.c.	87—89	78—83	..
70,000	10	April 29	11	6%	Hongkong & China, Ltd.	16½—16¾	8—9	..
86,600	—	—	—	9⅛%	Hornsey 7 p.c.	..	125—135	..
131,000	Stk.	Mar. 12	7½	7⅛%	Ilford A and C	151—154	112—117	..
65,780	"	"	6¾	5⅞%	Do. B	115—118	103—108	..
65,500	"	June 26	4	4%	Do. 4 p.c. Deb.	92—94	73—76	..
4,940,000	Stk.	May 14	9	4⅜%	Imperial Continental	150—160	78—83	79—81
1,235,000	Stk.	Feb. 12	8½	8⅛%	Do. 3½ p.c. Deb. Red.	84—86	65—67	..
235,342	Stk.	Mar. 12	6¾	6½%	Lea Bridge Ord. 5 p.c.	119—121	87—92	..
2,498,905	Stk.	Feb. 26	10	5%	Liverpool 5 p.c. Ord. { A	211—218	86—87	..
						{ B	146—148	
806,083	"	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	75—77	..
75,000	5	June 11	6	2/-	Malta & Mediterranean	4¼—4⅝	4—4½	..
250,000	100	April 1	4½	4½%	Met. of Melbourne { 4½ p.c. Deb.	99—101	89—93	..
541,920	20	May 28	4	6/-	Monte Video, Ltd.	11½—12	8¾—9½	..
1,876,892	Stk.	July 29	4½	4½%	Newc'tle&G'tesh'd Con.	98½—99½	79½—80½	..
529,705	Stk.	June 26	3½	3½%	Do. 3½ p.c. Deb.	82—83	75—77	..
55,940	10	Feb. 26	7/14/0	7/8⅝	North Middlesex 7 p.c.	14—15	10½—11½	..
900,000	Stk.	May 14	8	8%	Oriental, Ltd.	117—122	108—110	..
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7¼—7¾	2—3	..
60,000	50	Feb. 26	18	12%	Porto Alegre, Inland B	128—131	95—100	..
100,000	50	"	12	11%	Do. C	118—121	88—93	..
52,000	50	"	10	9%	Do. D	..	..	..
249,980	5	April 29	3	—	Primitiva Ord.	5½—6	2 2½	40/—42/6
499,960	5	June 26	5	2/6	" 5 p.c. Pref.	4⅞—5	3 3¼	64/6—65/-
521,600	100	June 2	4	4%	" 4 p.c. Deb.	91—93	80—82	79½ 79½
—	—	—	—	4%	" " " 1911	..	..	..
846,198	Stk.	June 26	4	4%	River Plate 4 p.c. Deb.	85—87	63—68	..
150,000	10	May 14	6	6/-	San Paulo { 6 p.c. Pref.	10¾—11	8—8½	..
125,000	50	July 1	5	5%	San Paulo { 5 p.c. Deb.	47—49	43—45	..
135,000	Stk.	Mar. 12	10	10%	Sheffield A	225—234	188—192	..
209,984	"	"	10	10%	Do. B	225—234	188—192	..
523,500	"	"	10	10%	Do. C	225—232	188—192	..
90,000	10	May 28	9	6/-	South African	10¼—11½	..	..
6,609,895	Stk.	Feb. 10	5/4/0	44/-	South Met., 4 p.c. Ord.	111—113	83—85	83½—84
1,895,445	"	July 10	8	8%	Do. 3 p.c. Deb.	73½—74½	59—61	59
224,820	Stk.	Feb. 26	8½	8%	South Shields Con. Stk.	167—169	145—147	..
952,795	Stk.	Feb. 26	6	48/4	S'th Suburb'n Ord. 5 p.c.	114—116	80—82	..
60,000	"	"	5	5%	Do. 5 p.c. Pref.	116—119	79—81	..
135,000	—	—	—	48/4	Do. West Kent.	..	..	..
187,558	"	June 26	5	5%	Do. 5 p.c. Deb. Stk.	115—118	90—92	89½
647,740	Stk.	May 14	5	5%	Southampton Ord.	99—102	83—93*	..
120,000	Stk.	Feb. 12	7½	7⅜%	Tottenham { A 5 p.c.	135—138	120—123	119—120
782,275	"	"	6	5⅞%	Tottenham { B 3½ p.c.	115—117	90—92	..
181,255	"	June 26	4	4%	District { 4 p.c. Deb.	87—89	73—75	..
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	..
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	60—65	..
236,476	Stk.	Mar. 12	5	5%	Tynemouth, 5 p.c. max.	108½—109½	91—92	..
					Wandsworth, Wimbledon, and Epsom—			
80,000	Stk.	Feb. 26	8⅜	78/9	Wandsworth A 5 p.c.	151—156	117—122	..
255,636	"	"	6⅔	63/9	" B 3½ p.c.	129—134	101—103	..
108,075	"	"	5/17/8	55/1½	" C 3½ p.c.	110—115	88—93	..
359,000	"	"	6¾	67/6	Wimbledon 5 p.c.	117—122	90—95	..
98,000	"	"	6⅔	63/9	Epsom 5 p.c.	121—126	98—103	..
88,416	"	June 26	3	3%	3 p.c. Deb. Stk.	66—69	53—56	..

* Ex. div. † Paid on Old 10 p.c. and 7 p.c. Standard Stocks.

The East and West Ardsley (Yorks.) District Council have decided to increase the war bonus to Council employees in all departments to 5s. per week all round.

An explosion, supposed to have been due to an accumulation of gas from a sprung-joint in a newly-laid main, occurred in a house at Pontefract last week. The floor was lifted, and a woman and her son were burned.

The statement has been made by the Lord Mayor of Dublin that the loss to the Corporation in respect of electricity in the area destroyed during the rebellion of Easter Week amounted to £8000, while the loss in rates would be £16,000.

A summons against a Batley Carr rag-grinder, at Dewsbury Police Court, last Tuesday, had to be adjourned for a week, in the hopes of the recovery of the defendant, who had been, on the morning of the intended hearing, removed to the infirmary suffering from gas poisoning. Defendant's wife, who had been out during the morning, had on her return been unable to get into the house, and on an entrance being forced her husband was found in a serious condition.

Before the evening services at most of the Lincoln churches had been concluded last Sunday week, there was a failure of the electric light. Fortunately, in some places gas-jets were available; but in others the services were brought to a hurried close,

NEWSPAPERS FOR NEUTRAL COUNTRIES.

The Secretary of the War Office has issued the following order:

The public are informed that newspapers and other printed publications will not be sent to Neutral European Countries unless posted direct from the office of publishers or newsagents who have obtained permission from the War Office for this purpose. Persons desiring to send newspapers, &c., to Neutral European Countries should, therefore, give their orders for execution to publishers or newsagents who have obtained such permission.

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